ANSI/WDMA
I.S. 1A

Industry Standard
for Interior Architectural
Wood Flush Doors

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WINDOW & DOOR
MANUFACTURERS ASSOCIATION

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WDMA ENIRONMENTAL STEWARDSHIP COMMITTEE

Statement of Beliefs

- The membership of the Window & Door Manufacturers Association (WDMA) supports the intent of environmental stewardship aimed at protecting the earth's resources including sound environmental practices to protect our air, water, land and the human, animal and plant life of our planet.

- WDMA encourages our members to make the most efficient use of materials and resources, to recycle or reuse materials where economically feasible, and to conduct business in a manner that supports environmental stewardship.

- WDMA supports and defines sustainable forest management as the stewardship of forests that promotes the health, productivity and potential to fulfill relevant ecological, economic and social functions at the local, national and global levels, both today and for future generations. We support programs that promote the use of best forestry management practices and sustainable forestry activity.

- We encourage and support our members to improve their practice of environmental stewardship and will work to assist them and the broader community in the implementation of sound environmental practices.

Approved by the WDMA Board of Directors

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FOREWARD

WDMA Door Division

The architectural wood door manufacturers and material supplier members of the WDMA Door Division combine to promote the use of architectural wood flush doors (I.S. 1A), and stile and rail doors (I.S. 6A) , to maintain quality standards and to provide other informational services.

Acceptance, specification and other use of this standard is voluntary, as the WDMA does not in any way control or regulate the method or manner of manufacture or production of industry products.

Because of constant technological changes and product improvements in component parts used by wood door manufacturers, industry standards referenced in this document may become outdated. This standard is under constant review so that situations such as these can be evaluated, recognized, and incorporated as quickly as possible. It is the intent of this standard to define wood doors consistent with industry practices and technical advances. This version (2026) takes precedence over previousversions.

Architectural Wood Flush Doors

An architectural wood flush door is the pinnacle of wood door manufacturing. Architectural wood flush doors are part of the building's permanent furniture. The requirements for their manufacture are, therefore, indicative of their place as the building's permanent, visible, operable equipment.

Introduction

ANSI/WDMA I.S.1A is the industry standard that establishes expectations for the performance and aesthetic attributes of architectural wood flush doors. These combined characteristics are used in producing a wood flush door for a particular opening. Function and performance are primarily controlled by the wood door construction. Aesthetics are primarily controlled by symmetry, species, veneer cut, matching of veneers and finish selected, or by the laminate selected.

Performance

WDMA standards require the designation of a performance duty level in addition to an aesthetic grade. Performance duty levels are based on the amount and severity of use. There are three levels of duty based on performance values of eight different attributes as defined in Section P. It is the responsibility of the specifier to select the duty level for each application. Duty levels include:

Extra Heavy Duty	Typically involves doors where use is considered heavy and frequent and requires the highest minimum performance standards.
Heavy Duty	Typically involves doors where usage is moderate and requires intermediate minimum performance standards.
Standard Duty	Typically involves doors where frequency of use is low and requires the lowest minimum performance standards.
Note**:** If the performance duty level is not specified, Heavy Duty is the default.	

Duty Level Application

As an aid to specifiers, below is a partial list of applications and their typical performance duty levels. Applications shown can be upgraded or downgraded to another performance duty level as chosen by the specifier.

Extra Heavy Duty Typically involves doors where use is considered heavy and frequent, requiring the highest minimum performance standards.	**Heavy Duty** Typically involves doors where usage is moderate, requiring intermediate minimum performance standards.	**Standard Duty** Typically involves doors where frequency of use is low, requiring the lowest minimum performance standards.
Classroom	Assisted Living Room Entry	Closet
Patient Rooms	Office - Interior Passage	Wardrobe
Bathroom - Public	Stairwell	Bathroom - Private
	Mechanical Service	Low usage Office
Dorm Room	Hallway	
Assembly areas	Storage	
Auditorium Entry	Apartment/Condo Entry	
Detention/Correctional	X-Ray	
Bullet Resistant	Acoustic	
Gymnasium/Locker Room	Medical Examination Room	
Surgical Entry		
Trauma Centers		
Hotel/Motel Room Entry		

Aesthetics

Aesthetics are influenced by several factors, as indicated in Section A. However, objective attributes are defined through the use of two grading levels. It is the responsibility of the specifier to select the best aesthetic grade for each application.

Premium	Uses AA grade faces (A grade faces for Western Red Alder, White Pine, Douglas Fir and Redwood) that are assembled using book and center balance match; other matching options are available but must be specified. Typically specified for use in those areas of a project where the very highest level of quality is required.
Custom	Uses A grade faces that are assembled using book and running match; other face options are available but must be specified. Typically specified for most high-quality, architectural woodwork.
Note**:** If the aesthetic grade is not specified, Custom grade is the default.	

Purpose

The purpose of this publication is to:

- Define the aesthetic grades and performance duty levels of architectural wood flush doors available through this Standard.
- Provide general information, standards, and tests that will ensure all products complying with this Standard can be evaluated on an equal basis.
- Provide a logical, simple system of references, keyed to guide specifications, which will enable the architect to specify wood flush doors thoroughly, precisely and accurately.
- Provide information necessary for the specifier to identify products and by which products are to be evaluated.
- This Standard applies to architectural wood flush doors intended for interior application. Doors specified to meet this Standard are not recommended for exterior use.

GUIDE SPECIFICATION CHECKLIST

The following is a listing of the basic information required in a specification for architectural flush wood doors. The WDMA recommends that these pieces of information appear in any specification for those products. Providing this minimal amount of information will ensure clear communication regarding the construction of the doors specified.

Wood Face Requirements:

Veneer Grade (Section A-2)
- ☐ AA (Default Premium) (A grade veneer for Western Red Alder, White Pine, Douglas Fir and Redwood)
- ☐ A (Default Custom)

Veneer Cut (Section A-3) choose cut below:
- ☐ Plain Sliced
- ☐ Rotary-Cut
- ☐ Quarter-Cut
- ☐ Rift-Cut (Oak only)
- ☐ As Specified

Veneer Leaf Match (Section A-4) choose match below:
- ☐ Book (Default)
- ☐ Slip
- ☐ Random
- ☐ Plank
- ☐ As Specified

Veneer Face Match (Section A-5) choose match below:
- ☐ Running (Default Custom)
- ☐ Balance
- ☐ Center Balance (Default Premium)
- ☐ As Specified

Veneer Grain Orientation
- ☐ Vertical (Default)
  - ☐ Horizontal
  - ☐ Sketch-face

Appearance of Pairs, Sets, and Transoms (Sections A-6 and A- 7)
- ☐ Matched
- ☐ Not Matched

HPDL Face Requirements:
- ☐ Manufacturer
- ☐ Thickness
- ☐ Pattern/Color/Finish

Detailed Requirements:
- ☐ Wood Beaded Lites
- ☐ Metal Vision Panels

Finish Requirements: (Section F-1) Finish Application
- ☐ Factory Clear
- ☐ Factory Stain
- ☐ Factory Opaque
- ☐ Other

Door Construction:

Aesthetic Grade (Section A-1)
- ☐ Premium
- ☐ Custom Performance Duty Level (Section P-1)
  - ☐ Extra Heavy Duty
  - ☐ Heavy Duty
  - ☐ Standard Duty
- ☐ Core Type (Section C-3)
  - ☐ Particleboard (PC)
  - ☐ Staved Lumber Core (SLC)
  - ☐ Structural Composite Lumber (SCLC)
  - ☐ Medium Density Fiberboard (MDFC)
  - ☐ Laminated Veneer Lumber (LVLC)
  - ☐ Fire Resistant Composite (FD)
  - ☐ Temperature Rise
  - ☐ Hollow Core (HC)
- ☐ Hardware Blocking (See Section C-7)
  - ☐ Hardware Reinforcement Blocking

Core/Edge Interface (Section C-5)
- ☐ Bonded
- ☐ Non-Bonded

Fire Door Test Method (Section C-8)
- ☐ UL 10B Neutral Pressure
- ☐ UL 10C Positive Pressure
  - ☐ Category A
  - ☐ Category B

Special Function Doors: (Section C-9)
- ☐ Sound Resistant (STC)
- ☐ Lead Lined (X-Ray)
- ☐ Bullet Resistant
- ☐ Attack Resistant

Environmental Doors (Section C-10) Environmental Rating Program
- ☐ Leadership in Energy & Environmental Design (LEED®)
- ☐ Green Globes®
- ☐ Collaborative for High Performance Schools (CHPS®)
- ☐ Living Building Challenge (LBC®)
- ☐ Other

GLOSSARY

Astragal- A molding or trim attached to the meeting edge of one door of a pair of door(s) which prevents swing-through and covers the gap where the doors meet when closed.

Balance Match- Two or more veneer components or leaves of equal size to make up a single face.

Barber Pole- An optical effect that often occurs when veneers are book matched, resulting in an alternating dark and light appearance. This is caused by slicing veneer, creating tight and loose sides that are placed adjacent to one another in the book matching process. The tight and loose sides reflect light differently, resulting in the varying appearance.

Bark Pocket- Bark around which normal wood has grown.

Bevel- A machine angle other than a right angle, i.e., a 3 degree bevel that is equivalent to a 1/8 inch drop in a 2 inch span (1 mm in 16mm).

Bird Peck- A mark or wound in a tree or piece of wood caused by birds pecking on the growing tree in search of insects.

Blended Repair Tapering- A repair referring to end splits, repaired with wood or filler similar in color to blend well with adjacent wood.

Blending- Color change that is detectable at a distance of 6 ft. to 8 ft. (1.8 m to 2.4 m) but which does not detract from the overall appearance of the door.

Blocking- A material used to replace core material in specific locations to provide improved screw holding for the attachment of hardware or provide additional structural door reinforcement.

Bonded Core- Stiles and rails are securely glued to the core prior to application of crossbanding, door skins, veneers or laminate.

Book Match- Adjacent pieces of veneer from a flitch or log are opened like a book and spliced to make up the face with matching occurring at the spliced joints. The fibers of the wood, slanting in opposite directions in the adjacent sheets, create a characteristic light and dark effect when the surface is seen from an angle.

Bow- A curvature along the door height, or a deviation from a flat plane from end to end. A deviation, flatwise, from a straight line drawn from end to end or top to bottom of a piece as measured at the point of greatest distance from the straightline.

Burl- A figure created by abnormal growth or response to injury that forms an interwoven, contorted, or gnarly mass of dense woody tissue on the trunk or branch of the tree.

Burl, conspicuous- A swirl, twist or distortion in the grain of the wood which usually occurs near a knot or crotch. A conspicuous burl is associated with abrupt color variation and/or a cluster of small dark piths caused by a cluster of adventitious buds.

Butt Joint- A joint formed by square edge surfaces (ends, edges, and faces) coming together. Also referred to as a end butt joint, edge butt joint.

Cathedral Grain- A grain appearance characterized by a series of stacked and inverted "V"s, or cathedral type of springwood (earlywood) summerwood (latewood) patterns common in plain sliced (flat cut) veneer (see split heart).

Center Match- An even number of veneer components or leaves of equal size (prior to edge trimming) matched with a joint in the center of the panel to achieve horizontal symmetry.

Certified Wood- Wood products that have been qualified by an independent third party agency as satisfying their proprietary requirements for responsible environmental practices.

Checks- Small slits running parallel to grain wood, caused chiefly by strains produced in seasoning and drying.

Comb Grain- A rift cut veneer with exceptionally straight grain and closely-spaced growth increments resembling the

appearance of long strands of combed hair

Compatible for color and grain- Components selected so that lighter-than-average color components are not adjacent to darker-than-average color components, no sharp contrasts in color exist between adjacent components, and grain of adjacent components does not vary widely and is similar in grain, character, and figure.

Compatible Species- Different species which are able to exist in a harmonious combination of color and grain.

Component (Of Face Veneer)- An individual piece of veneer that is joined to other pieces to achieve a full length and width face. Terms used interchangeably with component in the context of the face are piece and leaf.

Composite- A composite whose ingredients include cellulosic elements. These cellulosic elements can appear in the form of, but are not limited to: distinct fibers, fiber bundles, particles, wafers, flakes, strands and veneers. These elements may be bonded together with naturally occurring or synthetic polymers. Also, additives such as wax or preservatives may be added to enhance performance.

Composite Panel- A panel composed of a wood derivative such as MDF. Used for opaque finishes.

Conspicuous- See burl, conspicuous and knots, conspicuous pin.

Core- The innermost layer or section in component construction. For typical constructions see: Particleboard Core, Medium Density Fiberboard Core, Structural Composite Lumber Core, Staved Lumber Core, Laminated Veneer Lumber Core, Fire Resistant Composite Core and other special core types.

Core, Fire Resistant- A door core material meeting fire listing requirements for fire protection of 20 minutes or greater.

Cross Bar (Veneer)- Irregularity of grain resembling a dip in the grain running at right angles, or nearly so, to the length of the veneer.

Cross Grain (Cross Figures)- Grain direction irregularity due to interlocked fibers, uneven annual rings, or to the intersection of a branch and stem forcing the visual line of the grain to run at an angle to the length of the wood. It is characterized by mild or dominant patterns across the grain in some faces. Also known as Cross Figures

Crossbanding- An engineered wood product placed between the core and face veneer in 5-ply construction or a ply placed between the back and face of a 3-ply skin in 7-ply construction.

Crows Foot - Open splits within a knot, fanning out from the center/eye of the know (referenced from HP-1 standard).

Cup- A deviation in the face of a piece from a straight line drawn from end to end of a piece as measured at the point of greatest distance from the straight line.

Defect, Open- Checks, splits, open joints, knotholes, cracks, loose knots, wormholes, gaps, voids, or other opening interrupting the smooth continuity of the wood surface.

Discolorations- Stains in wood substances. Some common veneer stains are sap stains, blue stains, stain produced by chemical action caused by the iron in the cutting knife coming into contact with the tannic acid in the wood, and those resulting from the chemical action of the glue.

Door Frame- A group of components (wood, composite, aluminum or steel) that are assembled to form an enclosure and support for a door. Also known as door jambs.

Door, Louver- A door assembly of stiles and rails where the interior is filled with slat or chevron louvers.

Doze- A form of incipient decay characterized by a dull and lifeless appearance of the wood, accompanied by a loss of strength and softening of the wood substance.

Edge Band- A strip along the outside edges of the two sides and/or top and bottom of the door (See stiles/vertical edges, rails/horizontal edges).

Edge Glued (Edge Joint)- When the edges of boards are glued together to increase the width.

End Match- Butting adjacent veneer leaves on one panel end to end in sequence. Veneer leaves are book matched end to end. Generally used for very long panels or for projects in which only short-length veneers are available.

Exposed Surface – Surfaces normally visible after installation.

Face Veneer- The outermost exposed wood veneer surface of a veneered wood door.

Few- A small number of characteristics (generally less than five) without regard to their arrangement in the panel.

Figure- The natural pattern produced in the wood surface by annual growth rings, rays, knots, and natural deviations. From the normal grain, such as interlock and wavy grain, and irregular coloration.

Finger Joint- A series of interlocking fingers precision cut on the ends of two pieces of wood which mesh together and are held rigidly in place with adhesive.

Fire Rated Doors- A door complying with NFPA 80 that is listed and labeled by a qualified testing agency for fire-protection ratings. Ratings are indicated, based on testing at positive pressure, according to NFPA 252 or UL 10C, or at neutral pressure according to UL 10B. Doors can be rated as resisting fire for 20 minutes, 30 minutes, 45 minutes, 60 minutes, or 90 minutes. The door must be tested and carry an identifying label from a qualified testing and inspection agency.

Fire Resistant Composite Core- A core, typically incorporating minerals rather than wood fiber as the primary component, designed to improve fire resistance and thermal transmission,
Flake- See Fleck, Ray.

Flame Spread - The testing of interior wall and ceiling finishes per ASTM E84 for the regulation of flame spread and smoke development for interior wall and ceiling finishes.

Flat-Cut- See Plain-Sliced.

Fleck, Ray (Flake)- Portion of a ray as it appears on the quartered or rift cut surface. Fleck is often the dominant appearance in oak.

Flitch- A complete bundle of veneers sheets laid together in sequence as they are cut from a given log or section of a log.

Floating- Door constructed with a core non-bonded to the stiles and rails.

Gaps- 1) An unfilled opening in a continuous surface or between adjoining surfaces. 2) An open slit in the inner ply or plies or improperly joined veneer when joined veneers are used for inner plies.

Grain- The direction, size, arrangement and appearance of the fibers in wood or veneer.

Grain Slope- Expression of the angle of the grain to the long edges of the veneer component.

Grain Sweep- Expression of the angle of the grain to the long edges of the veneer component over a 12 inch (300 mm) length from each end of the door.

Hairline- A thin, perceptible line showing at the joint of two pieces of wood.

Half-round Slicing- Veneer slicing method similar to rotary slicing, in which the piece being sliced is secured to a "stay log" device that permits the cutting of the log on a wider sweep than when mounted with its center secured in the lathe to produce rotary sliced veneer. Plain-sliced or flat-sliced veneer can be produced this way. A type of half-round cutting is used to achieve plain-sliced or flat-cut veneer

Hardboard- Homogeneous panels manufactured primarily from inter-felted lignocellulosic (wood) fibers consolidated under heat and pressure with density of 31 lb/ft^3 (497 kg/m^3) or more.

Hardwood- General term used to designate lumber or veneer produced from temperate zone deciduous or tropical broad- leaved trees in contrast to softwood, which is produced from trees which are usually needle bearing or coniferous. The term does not infer hardness in its physical sense.

Heartwood- The non-active center of a tree generally distinguishable from the outer portion (sapwood) by its darker color.

High Pressure Decorative Laminate (HPDL)- A high impact resistant surface material consisting of decorative surface paper impregnated with melamine resins pressed over multiple kraft paper layers saturated with phenolic resins, thermoset at high pressure and temperature.

High Density Fiberboard (HDF)- The generic name for a panel made out of exploded wood fibers that have been

highly compressed and where the bonding of the wood fibers requires no additional materials, although resin is often added.

Holes, Worm- Holes resulting from infestation by worms greater than 1/16 inch (1.6 mm) in diameter and not exceeding 5/8 inch (16 mm) in length.

Horizontal Grain Veneers – The direction of the grain runs perpendicular to the height of the door.

Intumescent- A material applied to the surface of flammable products to reduce flammability that expands when exposed to extreme heat or fire to fill any gap between the door and frame or between doors.

Joint- The common edge between two adjacent materials in the same plane.

Joint, Edge- Joint running parallel to the grain of the wood.

Joint, Open- Joint in which two adjacent pieces of veneer in the same plane do not fit tightly together.

Knife Cuts Per Inch (KCPI)- A measure of the smoothness of machined lumber. Can be determined by holding the surfaced board at an angle to a strong light source and counting the visible ridges per inch, usually perpendicular to the profile. The surface is smoother with more knife marks per inch.

Knife Marks- Very fine lines that appear across the panel veneer or wood solids that can look as though they are raised resulting from some defect in the lathe knife that cannot be removed with sanding.

Knot- Cross section of tree branch or limb with grain usually running at right angles to that of the piece of wood in which it occurs.

Knot Holes- Voids produced when knots drop from the wood in which they were originally embedded.

Knots, Blending Pin- Sound knots 6.4 mm (1/4 inch) or less that generally do not contain dark centers. Blending pin knots are barely detectable at a distance of 1.8 m to 2.4 m. (6 ft. to 8 ft), do not detract from the overall appearance of the panel, and are not prohibited from appearing in all grades.

Knots, Conspicuous Pin- Sound knots 6.4 mm (1/4 inch) or less in diameter containing dark centers.

Knots, Open (Knot Holes)- Openings where a portion of the wood substance of the knot was dropped out, or where cross checks have occurred to produce an opening. (See Dead Knots)

Knots, Spike- Knots cut from 0^{O} to 45^{O} to the long axis of limbs.

Laminated Veneer Lumber Core (LVLC)- Manufactured by laminating veneer with all grain laid-up parallel. It can be manufactured by using various species of wood fiber in various thicknesses.

Lap (Veneer)- A condition where one piece of veneer in the same ply overlaps another piece.

Loose Side- In knife-cut veneer, that side of the sheet that was in contact with the knife as the veneer was being cut, and cutting checks (lathe checks) because of the bending of the wood at the knife edge.

Low Pressure Decorative Laminate (LPDL)- A decorative surface paper that is saturated with reactive resins. During hot press lamination, the resin flows into the surface of the substrate, creating a hard crosslinked thermosetting permanent bond and permanently changing the characteristics of both the paper and the board.

Louver- A panel constructed of slats installed in a door or openings to allowing various degrees of light, air, or sound passage. May be constructed as adjustable. Common types are slat and Chevron – an inverted "V" wood louver (vented or non-vented).

Medium Density Fiberboard (MDF)- A generic term for a composite panel product or core manufactured from lignocellulosic fibers and a bonding system cured under heat and pressure in a hot press by a process in which the added binder creates the entire bond. MDF is generally denser than plywood and particleboard

Medium Density Overlay (MDO)- Typically MDO is kraft paper saturated with resin and cured under high heat and pressure to make a hard, smooth, paintable surface.

Medium Density Fiberboard Core (MDFC)- Wood fiber and/or agri-fiber based materials that comply with ANSI A208.2.

Meeting Edges- Two adjacent door edges not separated by a mullion or transom bar. These are found in pair, Dutch door and door & transom applications.

Mineral- See Streaks, Mineral.

Mineral Core- See Core, Fire Resistant.

Mineral Stain- Olive and greenish-black streaks believed to designate areas of abnormal concentration of mineral matter; common in hard maple, hickory, and basswood. Also called Mineral Streak.

Mineral Streaks- Sharply contrasting elongated discoloration of the wood substance.

Natural- When referring to color and matching, veneers containing any amount of sapwood and/or heartwood.

Neutral Pressure- A fire door test procedure where the neutral pressure plane is at or near the top of the door. Sometimes referred to as negative pressure.

Nominal- 1) A term that designates a stated dimension as being approximate and subject to allowances for variation. 2) The average sizes (width and thickness) of lumber just out of the sawmill before being processed into usable board stock. Always larger than finished dimensions.

Not Noticeable- Not readily visible without careful inspection (as a measurement of natural or machining characteristics).

Not Restricted- Allowed, unlimited.

Occasional- A small number of characteristics that are arranged somewhat diversely within the face.

Particleboard- A generic term for a composite panel primarily composed of cellulosic materials (usually wood), generally in the form of discrete pieces or particles, as distinguished from fibers, bonded together with a bonding system, and which may contain additives. Particleboard may be further defined by the method of pressing. When pressure is applied in the direction perpendicular to the faces as in a conventional multi platen hot press, they are defined as flat platen pressed. When the applied pressure is parallel the faces, they are defined as extruded.

Particleboard Core- Wood fiber and/or agri-fiber based materials that comply with ANSI A208.1, minimum grade LD-1.

Pitch- An accumulation of resin that occurs in separations in the wood or in the wood cells themselves.

Pitch Pocket- A well-defined opening between the annual growth rings that contains pitch.

Pitch Streak- A well-defined accumulation of pitch in the wood cells in a more or less regular streak.

Pith- A small, soft core occurring in the center of the log.

Plain Slicing (Flat Cut)- Veneer sliced parallel to the pith of the log and approximately tangent to the growth rings to achieve flat cut veneer. Plain sliced veneer can be cut using either a horizontal or vertical slicing machine or by the half-round method using a rotary lathe.

Plank Matched- A face containing specially selected and assembled dissimilar (in color, grain and width) veneer strips of the same species, and sometimes grooved at the joints between strips, to simulate lumber planking.

Pleasing Match- A face containing components, which provide a pleasing overall appearance. The grain of the various components need not be matched at the joints. Sharp color contrasts at the joints of the components are not permitted.

Ply- A single sheet of veneer or several strips laid with adjoining edges that may or may not be glued, which forms one veneer lamina in a glued panel. In some constructions, a ply is used to refer to other wood components such as particleboard or MDF.

Positive Pressure- A fire door test procedure where the neutral pressure plane is located at 40 inches (1 m) above the sill.

Quartered (Quarter-sliced, Quarter Cut)- unlimited straight grain appearance achieved through the process od quarter-slicing or through the use of veneer cut in any fashion that produces a straight grain effect. Cut is radial to the pith to the extent that ray fleck is produced, and the amount of fleck is not limited.

Rails/Horizontal Edges- Top and bottom edge bands of door.

Random Matched (Mismatched)- A panel having a face made up of veneer strips of the same species which are selected and assembled without regard to color or grain, resulting in variations, contrasts and patterns of color and grain. Pleasing appearance is not required.

Ray Fleck- See Fleck, Ray.

Red/Brown- When referring to color and matching, veneers containing all heartwood, ranging in color from light to dark.

Repairs- A patch, shim, or filler material inserted and/or glued into veneer or a panel to achieve a sound surface.

Repairs, Blending- Wood or filler insertions similar in color to adjacent wood so as to blend well.

Rift Cut- A straight grain appearance achieved through the process of cutting at a slight angle to the radial on the half-round stay log or through the use of a veneer cut in any fashion that produces straight grain with minimal ray fleck.

Rotary Cut- Veneer produced by centering the entire log in a lathe and turning it against a broad cutting knife which is set into the log at an angle.

Rough Cut- Irregular shaped areas of generally uneven corrugation on the surface of veneer, differing from the surrounding smooth veneer and occurring as the veneer is cut by the lathe or slicer.

Running Match- The panel face is made from components running through the flitch consecutively. Any portion of a component left over from a face is used as the beginning component or leaf in starting the next panel.

Ruptured Grain- A break or breaks in the grain or between springwood and summerwood caused or aggravated by excessive pressure on the wood by seasoning, manufacturing, or natural processes. Ruptured grain appears as a single or series of distinct separations in the wood such as when springwood is crushed leaving the summerwood to separate in one or more growth increments.

Rustic- Lacking excessive refinement, having a rough surface or finish.

Sapwood- The living wood of lighter color occurring in the outer portion of a tree, sometimes referred to as sap.

Semi-exposed surface- top rail and bottom rail of door, unless top rail is visible from above.

Shake- A separation or rupture along the grain of wood in which the greater part occurs between the rings of annual growth. (See also RUPTURED GRAIN).

Sharp Contrast- For the purpose of this standard, this term means the veneer of lighter than average color should not be joined at the edges with veneer of darker than average color, and that two adjacent pieces of veneer should not be widely dissimilar in grain, figure and natural character markings.

Show Through (Sanding)- A defect caused by excessive sanding such that the crossbanding is visible through the face veneer.

Show Through (Telegraphing)- See Telegraphing

Skin- The face layer, whether flat or contoured, of flush doors, stile-and-rail doors, bending laminations, etc., typically composed of hardwood plywood (usually 3 ply), hardboard, or composition pane.

Sliced- Veneer produced by thrusting a log or sawed flitch into a slicing machine, which shears off veneer in sheets.

Slight- Visible on observation, but does not interfere with the overall aesthetic appearance with consideration of the applicable grade and common species characteristics of the panel.

Slip Matching- A process in which a leaf from a flitch is slid across the leaf beneath and, without turning, spliced at the joint. This process results in a panel or door which consists of all either loose or tight sides, minimizing barber pole or metamerism.

Smoke and Draft Control Door - A door that is a specialized safety barrier designed to stop the spread of smoke and gases during a fire. It features airtight smoke gaskets, self-closing mechanisms, and can be made of non-fire-rated or fire-rated materials. Tested in accordance with UL 1784.

Sound Transmission Class (STC)- A single number rating system derived from measured values of sound transmission loss or the acoustical performance of a building element, such as a door, window or wall. The higher the STC value, the better the rating and the better the acoustical performance value. Tested in accordance with ASTM E413 and E90.

Split Heart- A method of achieving an inverted "V" or cathedral type of springwood (earlywood)/summerwood (latewood), plain- sliced (flat-cut) figure by joining two veneer components of similar color and grain. A cathedral type figure must be achieved by a single component in AA grade; the split heart method is allowed in grades A and B. Each half of a split heart shall be subject to the minimum component width requirements for grade A and B faces.

Splits- Separations of wood fiber running parallel to the grain.

Splits, Hairline- A thin, perceptible line, separation, crack, or absence of wood fiber in the surface of a material or at the joint of two pieces of wood or veneer.

Staved Lumber Core (SLC)- A door core made with any combination of blocks or strips of wood glued together.

Stiles/Vertical Edges- The upright or vertical pieces of the core assembly of a wood flush door. Measurement. The width of the vertical edge/stile is measured at its widest side (the wide side of a beveled door).

Streaks, Mineral- Sharply contrasting elongated discoloration of the wood substance.

Structural Composite Lumber Core (SCLC)- An engineered wood product that is made by fusing a network of wood strands together with a water- resistant adhesive to produce a strong, solid and stable product that has true structural properties with excellent screw holding properties and very high split resistance.

Sweep- See Grain

Tape- Strips of gummed paper or cloth sometimes placed across the grain of large veneer sheets to facilitate handling and sometimes used to hold the edges of the veneer together at the joints prior to gluing.

Telegraphing- In veneer or laminated work, a defect caused by outlines and/or surface irregularities, such as frame parts, core laps, voids, extraneous core matter, etc., that are visible through the face veneers, applied top veneer, or laminate sheet following pressing and/or finishing. Also known as Show Through.

Thermally Fused Decorative Laminate Panel- A polyester or melamine resin-impregnated paper, thermally fused under pressure to a composite core.

Tight Side- In knife-cut veneer, that side of the sheet that was farthest from the knife as the sheet was being cut and containing no cutting checks (lathe checks).

Transom- An operable or non-operable fenestration product that is designed to be a companion product installed above a door system.

Twist- 1) A distortion in a wood piece caused by freed tension in the grain as the wood was drying. The surface appears to twist as the four corners of any face are no longer in the same plane. 2) In passage doors, any distortion in the door itself and not its relationship to the frame or jamb in which it is hung, measured by placing a straight edge or a taut string on the concaveface

Veneer (wood)- A thin layer or sheet of wood rotary-cut, sliced, or sawed from a log or flitch. Thickness may vary from, but not exceed, 0.3mm [.012”] to 6.4mm [.252”] thick.

Vertical Grain Veneer – The direction of the grain runs parallel to the height of the door.

Vine Marks- Bands of irregular grain running across or diagonally to the grain, which are caused by the growth of climbing vines.

Voids- See Gaps.

Warp- 1) Any deviation from a true or plane surface, including bow, crook, cup, twist, or any combination thereof. Warp restrictions are based on the average form of warp as it occurs normally. 2) In passage architectural wood doors, any distortion in the plane of a door itself and not its relationship to the frame or jamb in which it is to be hung. (See also BOW, CROOK, CUP, TWIST)

White- When referring to color and matching, veneers containing all sapwood, ranging in color from pink to yellow.

Wood Filler- An aggregate of resin and strands, shreds, or flour of wood, which is used to fill openings in wood and

provide a smooth, durable surface.

Wood Flush Door- An assembly consisting of a core and one or more edgebands, with at least two plies of overlay on each side of the core assembly. All parts are composed of wood, wood derivatives, fire-resistant composites, or decorative laminates.

Wormholes- Holes resulting from infestation of worms.

Worm Track (Scar)- A natural mark caused by various types of wood-attacking larvae. Worm tracks often appear as sound discolorations running with or across the grain in straight to wavy streaks. Sometimes referred to as “pith flecks” in certain species of maple, birch, and other hardwoods because of a resemblance to the color of the pith.

AESTHETICS

A-1: Aesthetic Grades for Architectural Wood Flush Doors

The design professional can specify with confidence using ANSI/WDMA I.S.1A guidelines. WDMA's Architectural Wood Flush Door Standard addresses both the aesthetic and performance attributes of the door. Both are important to achieve desired appearance and function.

Wood flush door aesthetics are specified by choosing a Premium grad or Custom grade door. These designators determine the basic appearance of the door with respect to veneer grade, matching requirements, pair and set matching, vertical edge species and other attributes that determine the appearance in individual doors and doors in pairs.

Premium	The highest grade commercially available in both material and fabrication. This grade is intended for the finest commercial, industrial and institutional buildings. Uses AA grade faces (A grade faces for Western Red Alder, White Pine, Douglas Fir and Redwood) that are assembled using book and center balance match; other face and matching options are available but must be specified.
Custom	The standard grade in both material and fabrication. This grade is intended for high-quality work. Uses A Grade faces that are assembled using book and running match; other face options are available but must be specified.
Note: If the Aesthetic Grade is not specified, Custom grade is the default.	
Note: Economy grade has been discontinued as it is seldom specified for architectural wood flush doors.	

It is also possible for a specifier to alter the basic premium grade or custom grade requirements to either upgrade or downgrade certain aspects of the door appearance, such as:

- Special flitch selection
- Sketch faces
- Special veneer matches
- Minimum veneer piece width
- Special color ranges (face and/or edge)
- Similar color and grain across all door faces
- Faces other than wood veneer
- Custom faces

There are other ways to modify the aesthetics of the door as well, such as by the addition of applied mouldings, lite mouldings, louvers and other accompanying parts. Grain pattern variation should be expected between veneer cuts and solid wood components in both custom and premium grades due to sourcing differences, cutting methods, and inherent natural grain and color variation from log to log within the same pieces. This should be expected to occur even when using compatible or identical wood species.

If additional grain or color matching is required, coordination with the door manufacturer is necessary.

The design professional is encouraged to consult directly with the manufacturer during the development of the design and specifications for these important projects.

A-2: Face Selection

Specifiers need to determine and specify the door face material required.

Veneers for Transparent Finishes

Premium Grade Veneer Doors:

Grade AA faces (A grade faces for Western Red Alder, White Pine, Douglas Fir and Redwood), book and center balance match, are standard for Premium grade doors. Face veneer shall be of sufficient thickness so as not to permit show through of crossbanding after sanding and/or before finishing. Other face options are available but must be specified.

Custom Grade Veneer Doors:

Grade A faces, book and running match, are standard for Custom grade doors. Face veneer shall be of sufficient thickness so as not to permit show through of crossbanding after sanding and/or before finishing. Other face options are available but must be specified.

Species: There are numerous domestic and foreign wood species available from which to select veneer type, including those further defined in Section A-8.

Matching: Many different visual effects can be obtained by face veneer matching. The various considerations in matching are described in the following sections:

- A-3: Appearance of Individual Pieces of Face Veneer
- A-4: Matching Between Individual Face Veneer Pieces
- A-5: Assembly of Spliced Face Veneer on a Door Face
- A-6: Appearance of Doors in Pairs or Sets
- A-7: Appearance of Doors with Transoms

Faces for Opaque (Painted) Finishes

Faces for opaque (painted or paint grade) are composite or veneer material that have a smooth, flat surface and are free of knots or heavy grain patterns so that paint can be applied to it smoothly and uniformly.

Premium Grade Faces for Opaque Finish Doors:

Medium Density Overlay (MDO), Medium Density Fiberboard (MDF) or High Density Fiberboard (HDF). These surfaces provide the optimum finishing surface for Premium grade doors.

Custom Grade Faces for Opaque Finish Doors:

Closed grain hardwood veneer, Medium Density Overlay (MDO), Medium Density Fiberboard (MDF), High Density Fiberboard (HDF), or other high-density surface. When using hardwood veneer, extra preparation is required prior to job site finishing because of the natural characteristics of wood.

Laminates

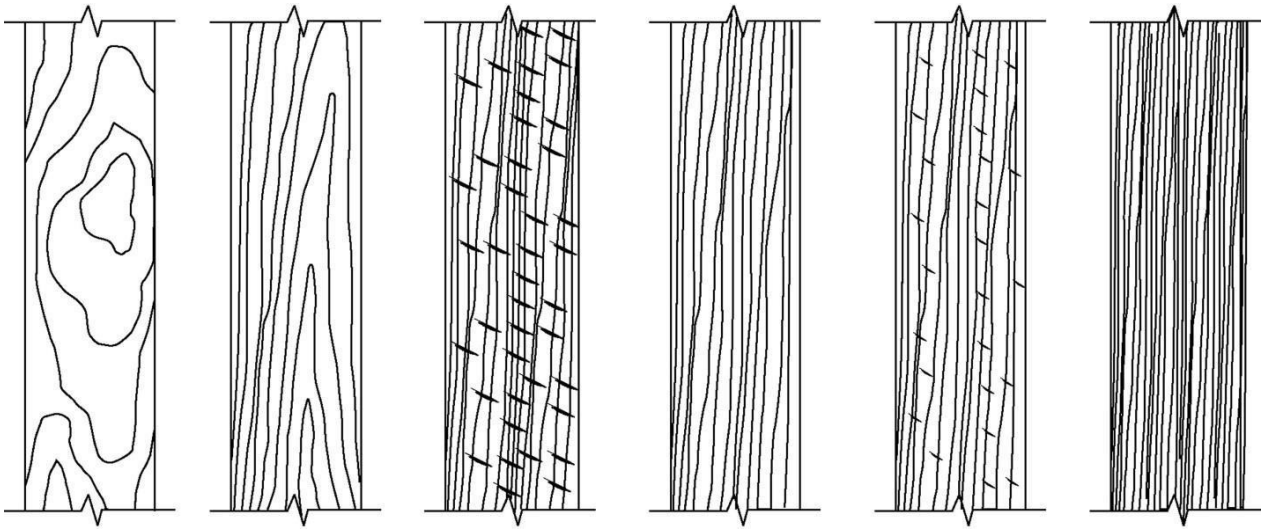
High Pressure Decorative Laminates (HPDL): High pressure decorative laminates of different colors and textures shall be permitted in the manufacture of architectural wood flush doors. High gloss laminates should be avoided because they tend to accentuate natural telegraphing.

Other Materials

Manufacturers offer a variety of other face options for doors, including but not limited to polyvinyl chloride (PVC), fiberglass reinforced plastic (FRP), cork and leather. Consult with a specific manufacturer for their specific offerings.

A-3: Appearance of Individual Veneer Leaves

The beauty of veneer is in the natural variations of texture, grain, figure, color, and the way it is assembled on a door face. The way in which a log is cut, in relation to the annual growth rings, determines the appearance of veneer. The illustrations below represent a typical appearance produced with the different types of cuts. However, veneers leaves will have natural variations in grain and pattern that are inherent in the species and cuts.



To see if the desired species of wood are available in the cuts referenced above, see the tables in section A-8. For species not referenced in Section A- 8, consult with door manufacturer for availability.

Rotary Cut

This is a veneer produced by centering the log in a lathe and turning it against a broad cutting knife which is set into the log at a slight angle, producing a more-or-less continuous sheet of veneer. This cut follows the log's annual growth rings, providing a generally bold random appearance.

Plain Sliced (Flat Cut)

Slicing is done parallel to a line through the center of the log, resulting in cathedral and straight grained patterns. The individual pieces of veneer are kept in the order they are sliced, permitting a natural grain progression when assembled as veneer faces.

Quarter Cut

By slicing the log roughly parallel to a radius line through the log segment, a series of stripes are produced that vary in width from species to species. Ray fleck (flake) is a characteristic of this cut in Red and White Oak.

Rift Cut

This cut slices slightly across the medullary rays, accentuating the vertical grain and minimizing the ray fleck (flake). Rift grain is restricted to Red and White Oak.

Comb Grain (limited availability) (only in Red & White Oak)

This is a rift cut veneer distinguished by the tightness and straightness of the grain along the entire length of the veneer face. Slight angle in the grain is allowed. Comb grain is restricted to Red and White Oak. There are occasional cross bars, and ray fleck (flake) is minimal.

Figure in Veneer Leaves

When assembling individual veneers with various degrees of figure, the assembly will produce repeating or non-repeating patterns based on the cut, species and match. Figure and figure patterns within the door face or components may appear based upon the cut, species and assembly technique of the individual veneer leaves. Figure is not a function of a species grade and special requirements must be specified. Architects and specifiers should take into consideration the level and degree of figuring that may occur and consult with the veneer supplier during the design development process to properly specify the desired amount of figure in the doorface. The full extent of figure may not be apparent until the door receives its final finish.

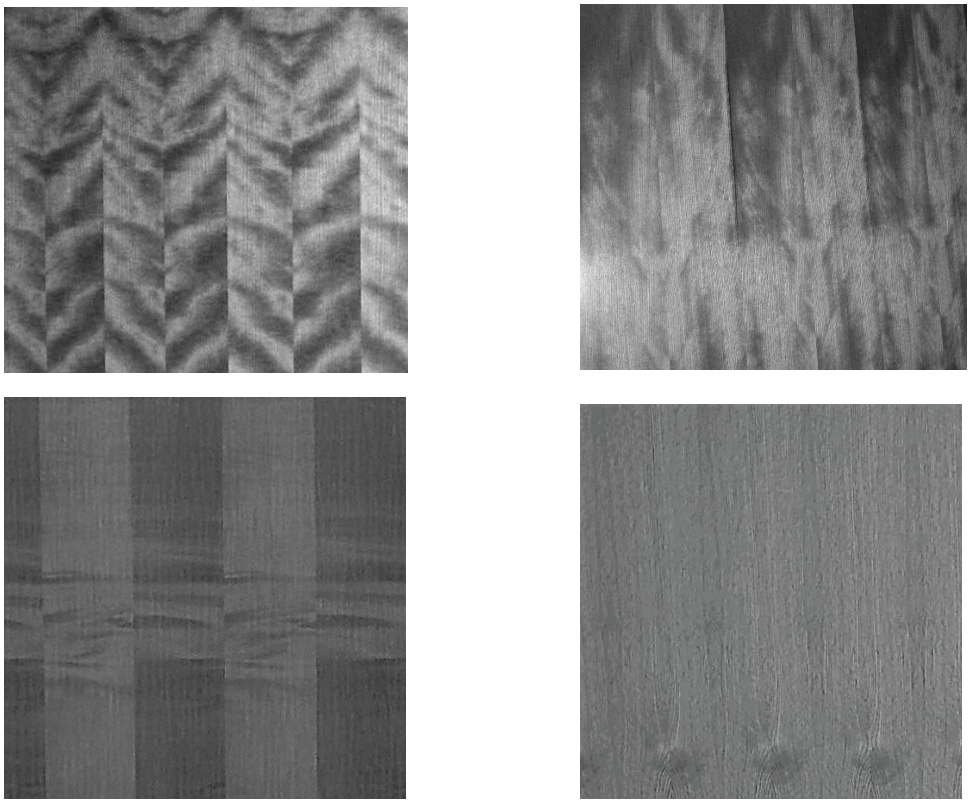
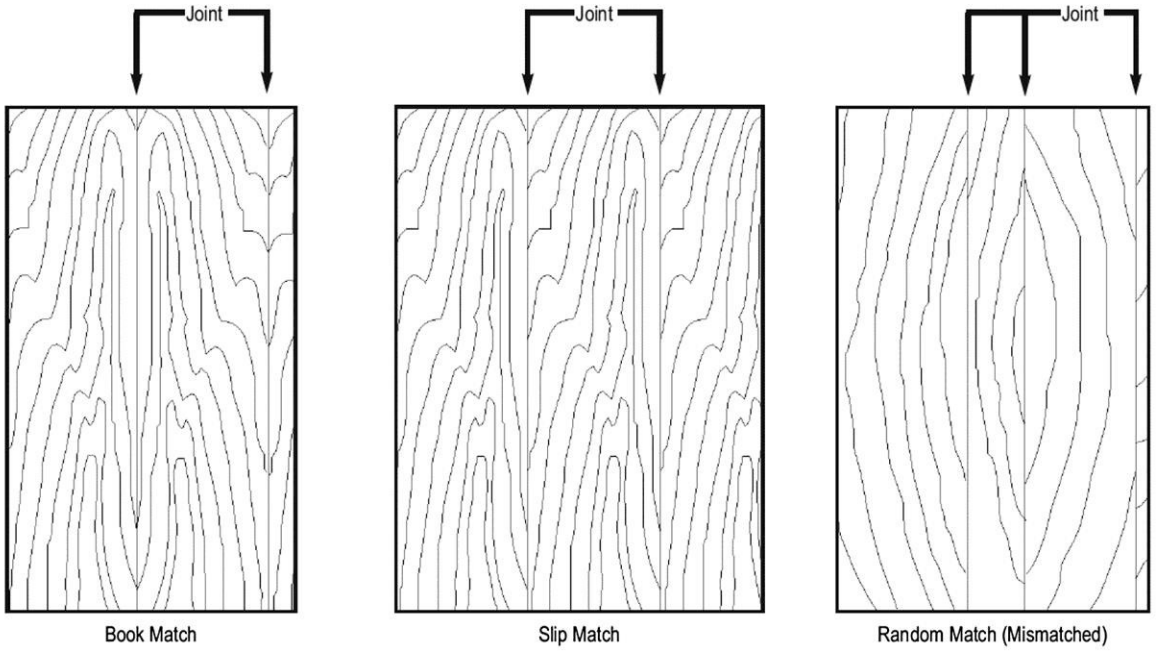


Figure A.3: Examples of varying figures that can appear in the door panel and components.

A-4: Matching Between Individual Veneer Leaves

The ways by which veneer leaves can be pieced together create a variety of looks for the assembled veneer. The type of match must be specified; if not specified, book match will be the default.



Illustrations reprinted with permission from, Architectural Woodwork Institute, Reston, Virginia

Book Match

The most commonly used match in the industry, every other piece of veneer is turned over so adjacent pieces are like two adjacent pages in an open book. The veneer joints match and create a mirrored image pattern at the joint line, yielding a maximum continuity of grain.

Barber Pole Effect in Book Match

Because the “tight” and “loose” sides alternate in adjacent pieces of veneer that are book matched, the leaves may accept stain or reflect light differently, which may cause a noticeable color variation called barber poling. Barber pole is not considered a manufacturingdefect. See slip match for further information on color variation.

Slip Match

Adjoining pieces of veneer are placed in sequence without turning over every other piece. The grain figure repeats, but joints won’t have a mirrored grain effect and may have a sharp color contrast. Slip matching is recommended and often used in Quarter, Rift Cut and Comb Grain veneers to minimize the barber pole effect. However, it may cause a sloping appearance of the veneer, especially in taller doors.

Random Matched (Mismatched)

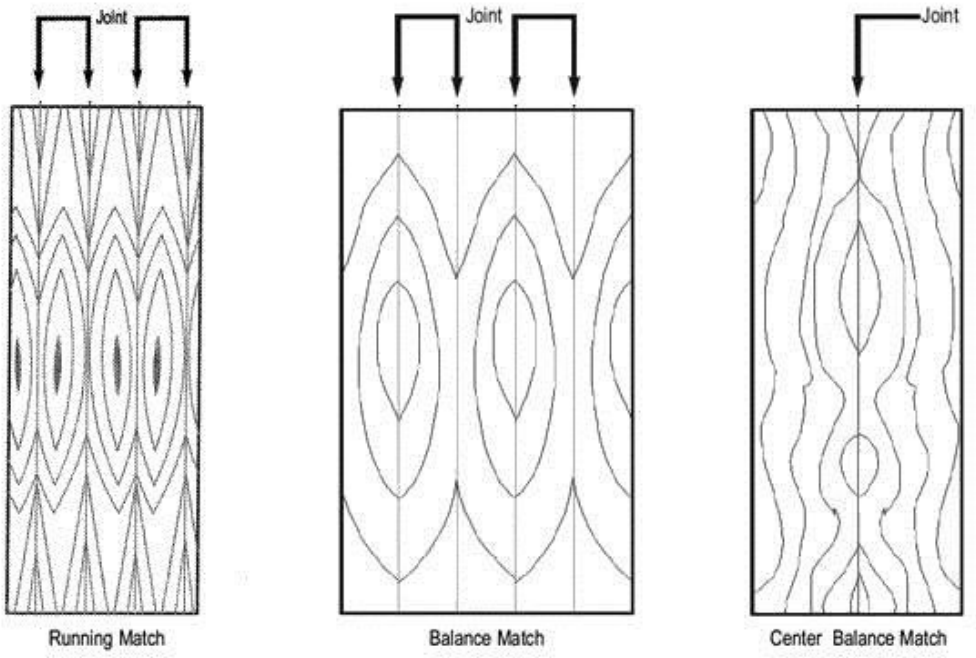
A face containing veneer leaves of the same species which are selected and assembled without regard to color or grain, resulting in variations, contrasts, and random patterns of color and grain. Pleasing appearance is not required. Random matched faces are not available pair matched or set matched.

Plank Matched (not illustrated)

A face containing specially selected and assembled veneer leaves from a single specie. The leaves are dissimilar (in color, grain and width) veneer strips of the same specie, and sometimes grooved at the joints between strips, to simulate lumber planking. Plank matched faces are not available pair matched or set matched.

A-5: Assembly of Spliced Veneer Leaves on Door Face

The way matched veneer leaves are assembled within a given door face can also help achieve a desired look. The type of assembly match must be specified. If no specification is made, Running Match is the default.



Illustrations reprinted with permission from the Architectural Woodwork Institute, Reston, Virginia

Running Match

Each face is assembled from as many veneer leaves as necessary The inside leaves will be equal in width to one another, the outside veneer leaves will likely be of unequal width. This provides a non-symmetrical appearance in each door face and results in high yield.

Balance Match

Each face is assembled from leaves of uniform width before trimming, resulting in a symmetrical appearance and medium yield.

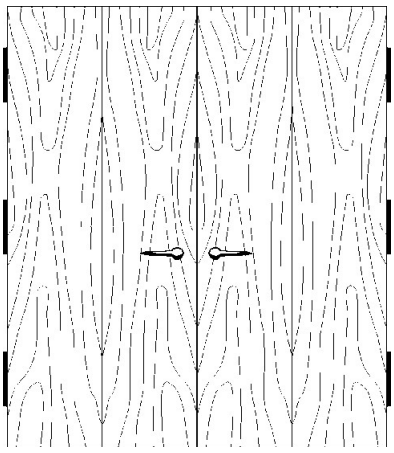
Center Balance Match

Each face is assembled from an even number of veneer leaves of uniform width before trimming. Thus there is a veneer joint in the center of the panel, producing symmetry but resulting in low yield.

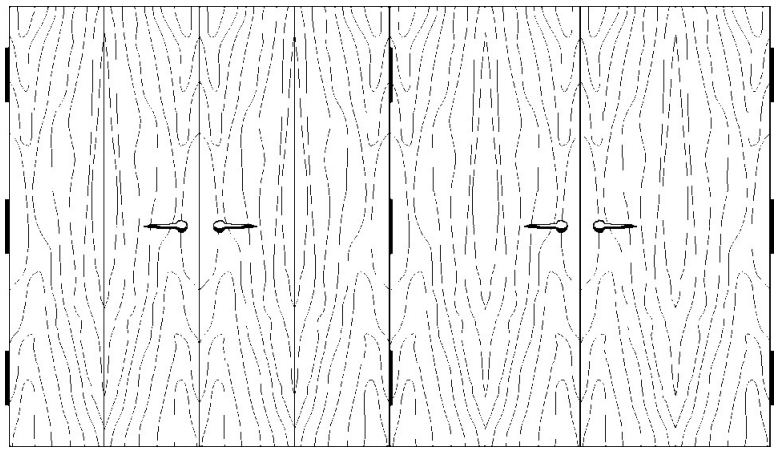
A-6: Appearance of Doors in Pairs or Sets

When a specific transition is desired between paired doors or sets of doors within a space, it is important to specify the requirement accordingly.

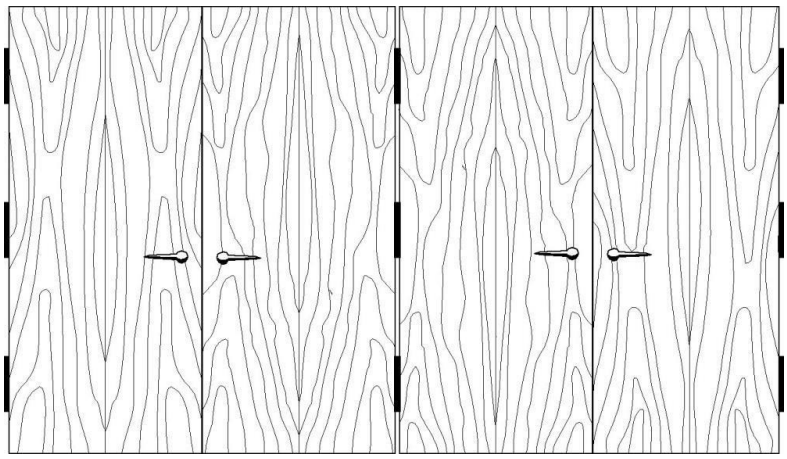
The illustrations below show faces constructed using the Center Match process. Pairs and sets may also be manufactured with Running Match or Balance Match faces.



Pair Match



Set Match



Running Match

Illustrations reprinted with permission from the Architectural Woodwork Institute, Reston, Virginia

Note:
The type of match must be specified. If no specification is made, running match is the most commonly used assembly method for A grade faces. Any sequence matching from opening to opening must be specified.

Pair Match

Two doors hung in in the same opening where the veneer is continued to the other leaf in either a Center, Book or Balance Match.

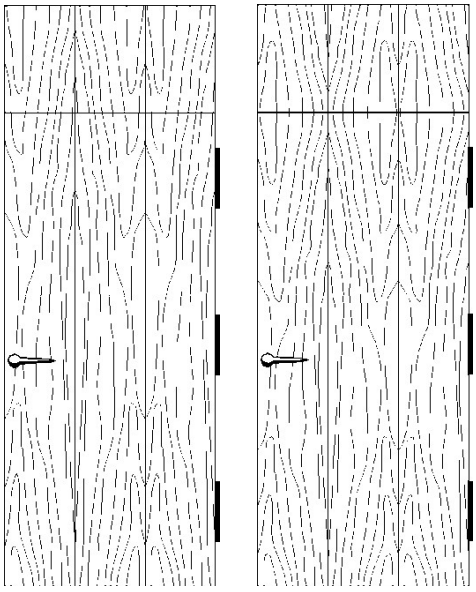
Set Match

Pair matching doors in groups or multiples (i.e., pair matching of pairs).

A-7: Appearance of Doors with Transoms

When specifying doors with adjacent transoms, the match between the door and transom must be specified.

Premium	Bottom Rail of Transom (exposed): Full width-- veneer or solid lumber (same species), or same material as door face. Birch faced doors shall be permitted to use compatible species.
Custom	Bottom Rail of Transom (exposed): Full width-- veneer or solid lumber(compatible species) or same material as door face.



Continuous Match End Match

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Continuous Match

Veneer extends from the bottom of the door to the top of the transom. Veneer length may limit this option.

End Match

Veneer extends from the bottom of the door to the top of the door with a mirror image at the transom.

With any of these door/transom match types, slight misalignment of veneer grain may occur at the transition from door to transom. A variation of grain alignment from side to side is acceptable for transom matching as follows:

- Single door and transom: 9.5mm (3/8 inch)
- Pair of doors with single transom: 12.7mm (1/2 inch)

A-8: Summary of Hardwood Door Face Grade Characteristics

The following tables identify the guidelines used to determine acceptable characteristics for a variety of wood species with respect to grades AA and A. If doors are intended to be installed adjacent to or are intended to become part of other architectural woodwork, veneer criteria shall conform to HPVA veneer panel grades. When selecting a door face veneer, degree of figure is not a function of the veneer specie or grade. For a specific figure configuration the architect or specifier should coordinate the specie, grade, and special figure requirements with the veneer supplier.

HARDWOOD DOOR FACE GRADE CHARACTERISTICS – Ash, Beech[b], Birch, Maple and Poplar

(Copyright 2024 Decorative Hardwoods Association – ANSI/HPVA HP-1-2024: American National Standard for Hardwood and Decorative Plywood by Permission 2024, Adapted to correlate to WDMA Industry Standard)

Note: Because of the inherent individuality of trees, consideration should be given to the overall appearance of the veneer face to determine the appropriate grade for that veneer.

Cut		**Plain-Sliced (Flat-Cut), Quarter-Cut, Rotary-Cut**					
Grade Description		**AA**			**A**		
Color and Matching		Sap	Heart	Nat.	Sap	Heart	Nat.
Sapwood		Yes	No	Yes	Yes	No	Yes
Heartwood		No	Yes	Yes	No	Yes	Yes
Color Streaks or Spots		Slight			Slight	Y	
Color Variation		Slight		Yes	Slight	Y	
Sharp Color Contrasts at Joints		Yes if Slip, Plank or Random matched			Yes if Slip, Plank or Random matched		
Type of Matching Book Matched Slip Matched Pleasing Matched		Yes Specify ---			Yes Specify ---		
Nominal Minimum Width of Door Face Components[a]	Plain-Sliced Quartered/ Rift Rotary-Cut	127 mm (5 in.) 76 mm (3 in.) 127 mm (5 in.)			102 mm (4 in.) 76 mm (3 in.) 102 mm (4 in.)		
Natural Characteristics (Except as limited below, natural characteristics are not restricted.)							
Small Conspicuous Burls & Pin Knots – Combined Avg. Number		2 per 1 m^2 (1 per 5 sq. ft., 6 per 4-ft x 8-ft panel)			4 per 1 m^2 (1 per 3 sq ft) 10 per 4-ft x 8-ft panel)		
Conspicuous Burls – Max. Size		6.4 mm (1/4 in.)			9.5 mm (3/8 in.)		
Conspicuous Pin Knots Avg. Number Max. Size: Dark Part Total		No			4 per 3 m^2 (1 per 8 sq ft) (4 per 4ft x 8-ft panel) 3.2 mm (1/8 in.) 6.4 mm (1/4 in.)		
Scattered Sound and Repaired Knots Combined Avg. Number Max. Size – Sound Max. Size – Repaired Avg. No. – Repaired		No			No		
Mineral Streaks		No; Maple, slight			Slight		
Bark Pockets		No			No		
Worm Tracks		Slight			Slight		
Vine Marks		Slight			Slight		
Cross Bars		Slight			Slight		
Manufacturing Characteristics							
Rough Cut / Ruptured Grain		No			No		
Blended Repaired Tapering Hairline Splits		Two 0.8 mm x 76 mm (1/32 in. x 3 in.) on panel ends only			Two 1.6 mm x 152 mm (1/16 in. x 6 in.)		
Repairs		Very Small Blending			Small Blending		
Special Characteristics (Except as limited below, special natural characteristics are not restricted.)							
Quartered		25.4 mm in 305 mm (1 in. in 12 in.) maximum grain slope, 63.5 mm in 305 mm (2-1/2 in. inches in 12 inches) maximum grain sweep					

Notes: Unfilled wormholes, open splits, open joints, open bark pockets, or doze not allowed in above grades.

[a] Outside components will be a different size to allow for edge trim loss and certain types of matching.

[b] American or European.

HARDWOOD DOOR FACE GRADE CHARACTERISTICS - Mahogany, Anegre, Makore, Sapele and other veneers with similar characteristics

(Copyright 2024 Decorative Hardwoods Association – ANSI/HPVA HP-1-2024: American National Standard for Hardwood and Decorative Plywood by Permission 2024, Adapted to correlate to WDMA Industry Standard)

Note: Because of the inherent individuality of trees, consideration should be given to overall appearance of the veneer face to determine the appropriate grade for that veneer.

Cut		**Plain-Sliced (Flat-Cut), Quarter-Cut, Rotary-Cut**	
Grade Description		**AA**	**A**
Color and Matching			
Sapwood		No	No
Heartwood		Yes	Yes
Color Streaks or Spots		Slight	Slight
Color Variation		Slight	Slight
Sharp Color Contrasts at Joints		Yes, if Slip, Plank or Random matched	Yes, if Slip, Plank or Random matched
Type of Matching: Book Matched Slip Matched Pleasing Matched		 Yes Specify ---	 Yes Specify ---
Nominal Minimum Width of Door Face Components[a]	Plain-Sliced Quartered/ Rift Rotary Cut	127 mm (5 in.) 76 mm (3 in.) 127 mm (5 in.)	102 mm (4 in.) 76 mm (3 in.) 102 mm (4 in.)
Natural Characteristics (Except as limited below, natural characteristics are not restricted.)			
Small Conspicuous Burls & Pin Knots – Combined Avg. Number		2 per 1 m^2 (1 per 5 sq ft, 6 per 4 x8 ft panel)	4 per 1 m^2 (1 per 3 sq ft, 10 per 4 x 8 ft panel)
Conspicuous Burls – Max. Size		6.4 mm (1/4 in.)	9.5 mm (3/8 in.)
Conspicuous Pin Knots Avg. Number Max. Size: Dark Part Total		No	4 per 3 m^2(1 per 8 sq ft) (4 per 4 x 8ft panel) 3.2 mm (1/8 in.) 6.4 mm (1/4 in)
Scattered Sound and Repaired Knots – Combined Avg. Number Max. Size – Sound Max. Size – Repaired Avg. No. – Repaired		No	No
Mineral Streaks		No	Slight
Bark Pockets		No	No
Worm Tracks		No	No
Vine Marks		Slight	Slight
Cross Bars		Occasional	Occasional
Manufacturing Characteristics			
Rough Cut / Ruptured Grain		No	No
Blended Repaired Tapering Hairline Splits		Two 0.8 mm x 76 mm (1/32 in. x 3 in.) on panel ends only	Two 1.6 mm x 152 mm (1/16 in. x 6 in.)
Repairs		Very Small Blending	Small Blending
Special Characteristics (Except as limited below, special natural characteristics are not restricted.)			
Unfilled Wormholes		No	No
Quartered		25.4 mm in 305 mm (1 in. in 12 in.) maximum grain slope, 63.5 mm in 305 mm (2-1/2 in. in 12 in.) maximum grain sweep	

Notes:

Open splits, open joints, open bark pockets, or doze not allowed in above grades.

[a] Outside components will be a different size to allow for edge trim loss and certain types of matching.

HARDWOOD DOOR FACE GRADE CHARACTERISTICS - Red and White Oak

(Copyright 2024 Decorative Hardwoods Association – ANSI/HPVA HP-1-2024: American National Standard for Hardwood and Decorative Plywood by Permission 2024, Adapted to correlate to WDMA Industry Standard)

Note: Because of the inherent individuality of trees, consideration should be given to overall appearance of the veneer face to determine the appropriate grade for that veneer.

Cut		**Plain-Sliced (Flat-Cut), Quarter-Cut, Rift and Comb grain, Rotary-Cut**			
Grade Description		**AA**		**A**	
		Red	White Oak	Red Oak	White
Color and Matching					
Sapwood		No	No	5%[(a)]	Yes [(a)]
Heartwood		Yes	Yes	Yes	Yes
Color Streaks or Spots		Yes		Yes	
Color Variation		Slight		Slight	
Sharp Color Contrasts at Joints		Yes if Slip, Plank or Random matched		Yes if Slip, Plank or Random matched	
Type of Matching: Book Matched Slip Matched Pleasing Matched		Yes Specify --		Yes Specify --	
Nominal Minimum Width of Door Face Components[b]	Plain-Sliced Quartered / Rift Rotary Cut	127 mm (5 in.) 76 mm (3 in.) 127 mm (5 in.)		102 mm (4 in.) 76 mm (3 in.) 102 mm (4 in.)	
Natural Characteristics (Except as limited below, natural characteristics are not restricted.)					
Small Conspicuous Burls & Pin Knots – Combined Avg. Number		3 per 1 m^2 (1 per 4 sq ft) 8 per 4ft x 8ft panel		4 per 1 m^2 (1 per 3 sq ft) 10 per 4ft x 8ft panel	
Conspicuous Burls – Max. Size		6.4 mm (1/4 in.)		9.5 mm (3/8 in.)	
Conspicuous Pin Knots Avg. Number Max. Size: Dark Part Total		No		4 per 3 m^2 (1 per 8 sq ft) 3.2 mm (4 per 4ft x 8ft panel 1/8in.) 6.4 mm (1/4 in.)	
Scattered Sound and Repaired Knots – Combined Avg. Number Max. Size – Sound Max. Size – Repaired Avg. No. - Repaired		No		No	
Mineral Streaks		No		Slight, Blending	
Bark Pockets		No		No	
Worm Tracks		No		No	
Vine Marks		No		Slight	
Cross Bars		Slight		Slight	
Manufacturing Characteristics					
Rough Cut / Ruptured Grain		No		No	
Blended Repaired Tapering Hairline Splits		Two 0.8 mm x 76 mm (1/32 in. x 3 in.) on panel ends only		Two 1.6 mm x 152 mm (1/16 in. x 6 in.)	
Repairs		Very Small Blending		Small Blending	
Special Characteristics (Except as limited below, special natural characteristics are not restricted.)					
Ray Fleck [c]		Slight, Blending		Slight, Blending	
Rift and Comb Grain		Rift permits 25.4 mm in 305 mm (1 in. in 12in.) maximum grain slope, 63.5 mm in 305 mm (2-1/2 in. in 12in.) maximum grain sweep, fleck not to exceed 9.5 mm (3/8in.) in width. Comb permits 12.7 mm in 305 mm (1/2 in. in 12in.) maximum grain slope, 12.7 mm in 305 mm (1/2 in. in 12in.) maximum grain sweep, fleck not to exceed 2.4 mm (3/32in) in width.			

Notes: unlimited wormholes, open splits, open joints, open bark pockets, or doze not allowed in above grades.

[a] Sap allowed in rotary only unless otherwise specified.

[b] 10% sap allowed in rift, comb, quarter-cut, and plain-sliced; 20% sap allowed in rotary.

[c] Outside components will be a different size to allow for edge trim loss and certain type of matching.

[d] Unless otherwise specified, quartered permits unlimited fleck.

HARDWOOD DOOR FACE GRADE CHARACTERISTICS - Pecan and Hickory

(Copyright 2024 Decorative Hardwoods Association – ANSI/HPVA HP-1-2024: American National Standard for Hardwood and Decorative Plywood by Permission
2024, Adap[illegible]e of the veneer face to determine the appropriate grade for that veneer.

Cut		Plain-Sliced (Flat-Cut), Quarter-Cut, Rotary-Cut	
Grade Description		AA	A
Color and Matching			
Sapwood		Yes	Yes
Heartwood		Yes	Yes
Color Streaks or Spots		Yes	Yes
Color Variation		Yes	Yes
Sharp Color Contrasts at Joints		Yes, if Slip, Plank or Random matched	Yes, if Slip, Plank or Random matched
Type of Matching Book Matched Slip Matched Pleasing Matched		Yes Specify --	Yes Specify --
Nominal Minimum Width of Door Face Components[a]	Plain-Sliced Quartered / Rift Rotary-Cut	127 mm (5 in.) 76 mm (3 in.) 127 mm (5 in.)	102 mm (4 in.) 76 mm (3 in.) 102 mm (4 in.)
Natural Characteristics (Except as limited below, natural characteristics are not restricted.)			
Small Conspicuous Burls & Pin Knots – Combined Avg. Number		11 per 1 m^2 (1 per 1 sq ft) 32 per 4 ft x 8 ft panel	22 per 1 m^2 (2 per 1 sq ft) 64 per 4 ft x 8 ft panel
Conspicuous Burls – Max. Size		6.4 mm 6.4 mm (1/4 in.)	9.5 mm (3/8 in.)
Conspicuous Pin Knots [(b)] Avg. Number Max Size: Dark Part Total		6 per 1 m^2 (1 per 2 sq ft) 16 per 4ft x 8 ft panel 3.2 mm (1/8 in) 6.4 mm (1/4 in)	22 per 1 m^2 (2 per 1 sq ft) 64 per 4ft x 8 ft panel) 3.2 mm (1/8 in) 6.4 mm (1/4 in)
Scattered Sound and Repaired Knots – Combined Avg. Number Max. Size – Sound Max. Size – Repaired Avg. No. – Repaired		No	No
Mineral Streaks		Slight	Slight
Bark Pockets		No	Small, Occasional
Worm Tracks		No	Slight
Vine Marks		Slight	Occasional
Cross Bars		Slight	Occasional
Manufacturing Characteristics			
Rough Cut / Ruptured Grain		No	No
Blended Repaired Tapering Hairline Splits		Two 0.8 mm x 76 mm (1/32 in. x 3 in.) on panel ends only	Two 1.6 mm x 152 mm (1/16 in. x 6 in.)
Repairs		Very Small Blending	Small Blending
Special Characteristics (Except as limited below, special natural characteristics are not restricted.)			
Bird Peck [(c)]		No	Slight
Knife Marks		Knife marks may occur in these high-density species.	
Quartered		25.4 mm in 305 (1in. in 12in.) mm maximum grain slope, 63.5 mm in 305 mm (2-1/2 in. in 12 in.) maximum grain sweep	

Notes: Unfilled wormholes, open splits, open joints, open bark pockets, or doze not allowed in above grades.

[a] Outside components will be a different size to allow for edge trim loss and certain types of matching.

[b] For Pecan and Hickory, conspicuous pin knots means sound knots 6.4 mm (1/4 inch) or less in diameter with dark centers larger than 1.6 mm. Blending pin knots are sound knots 6.4 mm (1/4 inch) or less in diameter with dark centers 1.6 mm (1/16 inch) or less and are allowed in all grades of Pecan and Hickory.

[c] To achieve a more rustic appearance, bird peck shall be specified.

HARDWOOD DOOR FACE GRADE CHARACTERISTICS - Walnut and Cherry

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Note: Because of the inherent individuality of trees, consideration should be given to overall appearance of the veneer face to determine the appropriate grade for that veneer.

Cut		**Plain-Sliced (Flat-Cut), Quarter-Cut, Rotary-Cut**	
Grade Description		**AA**	**A**
Color and Matching			
Sapwood		No	No [a]
Heartwood		Yes	Yes
Color Streaks or Spots		Slight	Slight
Color Variation		Slight	Slight
Sharp Color Contrasts at Joints		Yes if Slip, Plank or Random matched	Yes if Slip, Plank or Random matched
Type of Matching Book Matched Slip Matched Pleasing Matched		 Yes Specify --	 Yes Specify --
Nominal Minimum Width of Door Face Components [b]	Plain-Sliced Quartered / Rift Rotary-Cut	127 mm (5 in.) 76 mm (3 in.) 127 mm (5 in.)	102 mm (4 in.) 76 mm (3 in.) 102 mm (4 in.)
Natural Characteristics (Except as limited below, natural characteristics are not restricted.)			
Small Conspicuous Burls & Pin Knots – Combined Avg. Number		3 per 1 m^2 (1 per 4 sq ft, 8 per 4 x 8 ft panel)	8 per 1 m^2 (1 per 1-1/3 sq ft, 24 per 4 x 8 panel)
Conspicuous Burls – Max. Size		6.4 mm (1/4 in)	9.5 mm (3/8 in)
Conspicuous Pin Knots [c] Avg. Number Max Size: Dark Part Total		3 per 1 m^2 (1 per 5 sq ft) 6 per 4ft x 8ft panel 3.2 mm (1/8 in) 6.4 mm (1/4 in)	6 per 1 m^2 (1 per 2 sq ft) 16 per 4ft x 8 ft panel 3.2 mm (1/8 in) 6.4 mm (1/4 in)
Scattered Sound and Repaired Knots – Combined Avg. Number Max. Size – Sound Max. Size – Repaired Avg. No. – Repaired		No	No
Mineral Streaks		Slight	Slight
Bark Pockets		No	No
Worm Tracks		No	No
Vine Marks		Slight	Occasional
Cross Bars		Slight	Occasional
Manufacturing Characteristics			
Rough Cut / Ruptured Grain		No	No
Blended Repaired Tapering Hairline Splits		Two 0.8 mm x 76 mm (1/32 in. x 3 in.) on panel ends only	Two 1.6 mm x 152 mm (1/16 in. x 6 in.)
Repairs		Very Small Blending	Small Blending
Special Characteristics (Except as limited below, special natural characteristics are not restricted.)			
Gum Spots		Occasional gum spots in Cherry	Occasional gum spots in Cherry
Quartered		25.4 mm in 305 mm (1 in. in 12 in.) maximum grain slope, 63.5 mm in 305 mm (2-1/2 in. in 12 in.) maximum grain sweep	

Notes: Unfilled wormholes, open splits, open joints, open bark pockets, or doze not allowed in above grades.

[a] Sapwood is allowed in grades A ; however, the percentage must be agreed upon between buyer and seller.

[b] Outside components will be a different size to allow for edge trim loss and certain types of matching.

[c] For Walnut and Cherry, conspicuous pin knots means sound knots 6.4 mm (1/4 inch) or less in diameter with dark centers larger than 1.6 mm (1/16 inch). Blending pin knots are sound knots 6.4 mm (1/4 inch) or less in diameter with dark centers of 1.6 mm (1/4 inch) or less and are allowed in all grades of Walnut and Cherry.

HARDWOOD DOOR FACE GRADE CHARACTERISTICS – Western Red Alder

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Note: Because of the inherent individuality of trees, consideration should be given to overall appearance of the veneer face to determine the appropriate grade for that veneer.

Cut	**Plain-Sliced (Flat-Cut)**		
Grade Description	A	B	C/ Rustic
Color and Matching			
Sapwood	Yes	Yes	Yes
Heartwood	Yes	Yes	Yes
Color Streaks	Slight	Slight	Yes
Color Variation	Slight	Slight	Yes
Nominal Minimum Width of Face Components	76 mm (3 inches)	76 mm (3 inches)	76 mm (3 inches)
Type of Matching			
Plank Matched for pleasing appearance	Yes[a]	Yes[a]	Yes[a]
Book Matched for color and grain at the joints	Specify	Specify[b]	Specify
Natural Characteristics			
Conspicuous Burls- Max. Size	12.7 mm (1/2 inch)	Yes	Yes
Pin Knots	Yes	Yes	Yes
Bark Pockets	No	Few Maximum Size 6.4mm x 50.8mm (1/4 inch x 2 inches)	Unlimited in number Maximum size 6.4mm x 102mm (1/4 inch x 4 inches)
Sound Knots[b] - Max Size (may contain dark centers)	12.7 mm (1/2 inch)	50.8 mm (2 inches)	Yes
Repaired Knot Holes[b] Number; Maximum Size	Two 6.4mm (1/4 inch) Max Dia.	Six 19 mm (3/4 inch) Max. Dia.	Unlimited 38 mm (1-1/2 inches) Max. Dia.
Manufacturing Characteristics			
Rough Cut	No	Small Areas Allowed	Small Areas Allowed
Stain	No	Slight	Yes
Blended Repaired Tapering Hairline Splits	Two 1.6mm x 152 mm (1/16 inch x 6 inches) on panel ends	Three 3.2 mm x 254 mm (1/8 inch x 10 inches) on panel ends	3.2mm x 305mm (1/8 inch x 12 inches)
Repairs	Blending	Blending	Yes
Special Characteristics	-	Open Knots [b]	-

Notes:

[a] The general color of individual components shall not be significantly lighter or darker than that of the other components in the face.

[b] Book Matched Grade B – one row of unlimited 19 mm (3/4 inch) open knots is allowed.

SUMMARY OF DECORATIVE SOFTWOOD DOOR FACE GRADE CHARACTERISTICS – White Pine (and Western Red Cedar)

(Copyright 2024 Decorative Hardwoods Association – ANSI/HPVA HP-1-2024: American National Standard for Hardwood and Decorative Plywood by Permission 2024, Adapted to correlate to WDMA Industry Standard)

Note: Because of the inherent individuality of trees, consideration should be given to overall appearance of the veneer face to determine the appropriate grade for that veneer.

Cut	**Rotary and Sliced Knotty Veneer**			
Grade Description	**A (Face)**	**B (Face)**		**C (Face)**
		Red Cedar	White Pine	
Color and Matching				
Sapwood	Yes	Yes		Yes
Heartwood	Yes	Yes		Yes
Color Streaks	Slight	Yes		Yes
Color Variation	No	Slight		Yes
Stain, Blue and	No	Slight		Yes
Type of Matching				
Plank Matched for	Yes	Yes		NA
Book Matched for color and grain at	-	-		-
Natural Characteristics				
Burls	Yes	Yes		Yes
Pin Knots	Yes	Yes		Yes
Sound Knots; Max.	50.8 mm (2 inches)	89 mm (3 1/2 inches)		Yes
Spike Knots; Max.	50.8mm (2 inches)	89 mm (3 1/2 inches)		Yes
Repaired Knot Holes; Max.	19 mm (3/4 inch)	38 mm (1-1/2 inches)		Unlimited
Pitch Streaks	Small	Small		Yes
Pitch Pockets	Few to 3.2mm x 25.4 mm (1/8 inch x 1 inch)	Few to 3.2 mm x 50.8 mm (1/8 inch x 2 inches)		Yes
Crows Foot	Slight	Occasional	Yes	Yes
Manufacturing Characteristics				
Rough Cut	No	Slight		Yes
Blended Repaired Tapering Hairline	Yes	Yes		Yes ([a])
Repairs	Blending	Blending		Yes
Cross Bars	-	-		-

Notes: Unfilled wormholes, open splits, open joints, ruptured grain, or doze not allowed in grades A and B above

[a] Open hairline checks and splits up to 305mm (12 inches) long and 3.2mm (1/8 inch) wide allowed.

VERTICAL GRAIN SOFTWOOD DOOR FACE CHARACTERISTICS – Douglas Fir and Redwood)

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Note: Because of the inherent individuality of trees, consideration should be given to overall appearance of the veneer face to determine the appropriate grade for that veneer.

**Very limited availability

Cut	**Sliced - Vertical Grain**	
Grade Description	A (Face)	A (Face)
	Douglas Fir	Redwood
Color and Matching		
Sapwood	Blending	Yes
Heartwood	Yes [a]	Yes [a]
Color Streaks	No	No
Color Variation	Slight	Slight
Stain, Blue and	No	No
Type of Matching		
Book Matched - matched for color and grain at	Yes[b]	Yes[b]
Planked Matched - for pleasing appearance	Yes[b]	Yes[b]
Natural Characteristics		
Burls	Small	Small
Pin Knots	Blending, 1 Row	Yes
Sound Knots; Max.	No	No
Spike Knots; Max.	No	No
Repaired Knot Holes; Max. Size	No	No
Pitch Streaks	Blending	No
Pitch Pockets	No	No
Crows Foot	No	No
Manufacturing Characteristics		
Rough Cut	Slight	Slight
Blended Repaired Tapering Hairline	Yes	Yes
Repairs	Blending	Blend
Cross Bars	No	No

Notes: Unfilled wormholes, open splits, open joints, ruptured grains, or doze not allowed

a Heartwood must have 6 or more annual rings per 25.4 mm(1inch)

b Shall be provided book matched unless otherwisespecified

A9: Fabrication

General Requirements Workmanship

Prior to factory finish or field finishing, all exposed and semi-exposed surfaces are to be free of tear out, chips, dents, gouges, tool marks, adhesive residue, sand through, cross sanding, over/under filling, sharp edges, or similar defects in any 1 square meter (10 square feet) of surface area per grade as follows: (See Section F-6 for visual inspection standards for factory finished doors)

- Premium grade – None
- Custom grade – Maximum of 5 not to exceed 0.8 mm (1/32 inch) in any dimension

Exposed Surface Quality (Minimum Requirements)

DOOR FEATURES	Premium Grade		Custom Grade	
Finish Type	**Transpare**	**Opaque**	**Transpare**	**Opaque**
Flat Surfaces	150 grit	150 grit	150 grit	150 grit
Moulded Surfaces	120 grit	120 grit	20 KCPI	20 KCPI
Shaped Surfaces	120 grit	120 grit	20 KCPI	20 KCPI
Sanding Scratches	Not visible from a distance of 0.9 m (3 feet).	Not a defect	Not visible from a distance of 1.8 m (6 feet).	Not a defect

NOTES: No tear outs or hit-or-miss finish allowed. No knife nick marks allowed. Glue and filler, if used, must be inconspicuous and sanded as smoothly as the surrounding surface.

Veneer Faces, Opaque or Transparent Finish

- Joints must be tight.
- Veneer faces must be completely glued to substrate.
- Veneer faces shall be thoroughly sanded.
- Bleed through of glue at veneer joints that visually affects an applied finish is not permitted.
- Figure is not a function of species grade and any special desires must be so specified.

Vertical Edges, Opaque or Transparent Finish

- Vertical edges shall be smoothly sanded, free of knife and saw marks.
- Voids are not permitted between veneer layers and solid wood edges.
- When allowed under Section C12, joints in edges shall be tight.
- Vertical edges shall have an eased edge at intersections of edges and face veneers.

Crossbands

Crossbands, when used, shall be full piece or edge glued without voids.

- For non-fire doors exceeding standard size limitations 1.2 m (4 feet) in width and or 3.0 m (10 feet) in height, tight butt joints are allowed.

Horizontal Edges

- Joints between stiles and top rails shall be without gaps.

- Horizontal edges shall be sound without splits, shake, or doze.
- There shall be no gaps between veneer layers and solid horizontal edges.

PERFORMANCE

P-1: Performance Standards for Architectural Wood Flush Doors

Performance is a very important aspect of specifying Architectural Wood Flush Doors and is directly related to the use of the door. The following table identifies the tests that are conducted and the criteria that must be reached in order to qualify a given door assembly for each specific Performance Duty Level. For information on selecting the appropriate performance duty level for the project, refer to the Foreword for suggested application(s).

ANSI/WDMA I.S.1A Flush Wood Door Minimum Performance Standards

Performance Attribute	Performance Duty Level		
	Extra Heavy Duty	**Heavy Duty (c)**	**Standard Duty**
Adhesive Type , WDMA TM-6	Type I or Type II	Type I or Type II	Type I or Type II
Cycle Slam, WDMA TM-7	1,000,000 cycles	500,00 cycles	250,000 cycles
Hinge-Loading, WDMA TM-8	2440 N (550 lbs.)	2110 N (475 lbs.)	1780 N (400 lbs.)
Door Finishes Various ASTM test methods	TR-6/8, OP-6/8 or equal [a]	TR-4/OP-4 or equal [a]	TR-2/OP-2 or equal [a]
Screwholding, WDMA TM-10			
Stile and Rail Face	2440 N (550 lbs.)	2110 N (475 lbs.)	1780 N (400 lbs.)
Vertical Door Edge[b]	2440 N (550 lbs.)	2110 N (475 lbs.)	1780 N (400 lbs.)
Horizontal Door Edge [b]	1330 N (300lbs.)	1060 N (240 lbs.)	810 N (180 lbs.)
Vertical Edge Impact, WDMA TM-15	Edges to be solid hardwood or comply with TM-15.		
Telegraph, Section T-1	Maximum 0.25 mm in any 76 mm span (0.010 inch in any 3-inch span)		
Warp Tolerance, Section T-2	Maximum 6.4 mm in any 1050 mm x 2100 mm (0.25 inch in any 3’-6” x 7’-0”) door section		
Squareness, Section T-3	Diagonal variance 3.2mm (1/8 inch)		

Notes:

[a] See Section F7. Other formulations may exhibit similar performance characteristics but must meet or exceed the performance levels for the systems specified to be considered asequal.

[b] Horizontal and vertical door edge screwholding applies when hardware is to be attached. See section C7 for blocking configuration and details.

(c) If the performance duty level is not specified, Heavy Duty is the default.

P-2: Dimensional Information

The following dimensional information and tolerances are determined at the time of shipment. Exposure of the door to variations in temperature and moisture during shipment, storage, and prior to building occupancy may affect the size of door components and their interface.

Doors

Width:	±1.6 mm (±1/16 inch) not pre-fit
	±0.8 mm (±1/32 inch) factory pre-fit
Height:	±1.6 mm (±1/16 inch)
Thickness:	±1.6 mm (±1/16 inch)

Hardware Machining

Hinge Mortises

Location:	±0.8 mm (±1/32 inch)
Height:	+0.8 mm, -0 mm (+1/32 inch, -0 inch)
Depth:	+0.6 mm, -0 mm (+.025 inch, -0 inch)
Backset:	+0 mm, -0.8 mm (+0 inch, -1/32 inch)

Lock Fronts

Location:	±0.8 mm (±1/32 inch)
Height:	+0.8 mm, -0 mm (+1/32 inch, -0 inch)
Width:	+0.8 mm, -0 mm (+1/32 inch, -0 inch)
Depth:	+0.6 mm, -0 mm (+.025 inch, -0 inch)

Typical Pre-fit Clearances

Non-fire rated Doors

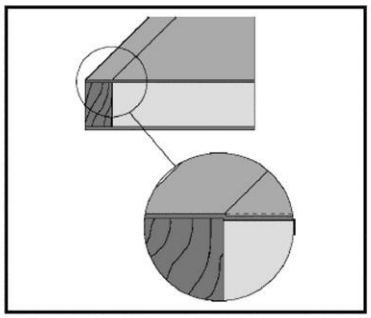
Top & Hinge Edges	3 mm (1/8 inch) clearance
Lock Edge, Single Door	3 mm (1/8 inch) clearance
Meeting Edges, Pairs	1.6 mm (1/16 inch) per leaf
Bottom Edge	20 mm (3/4 inch) maximum from finished floor

Non-fire rated Transoms, Side Lites & Dutch Doors

Width	Per manufacturer's specifications
Height	Per manufacturer's specifications

Fire Rated Openings: See NFPA 80 Standard for Fire Doors and Other Opening Protectives or Manufacturer’s Listing

TESTS



T-1: Show Through or Telegraph

Telegraphing of vertical and horizontal edges and cores is considered a defect when the face of the door varies from a true plane in excess of 0.25 mm in any 76 mm span (0.010 inch in any 3 inch span), using a straight edge and feeler gauge or other accurate measuring methods.

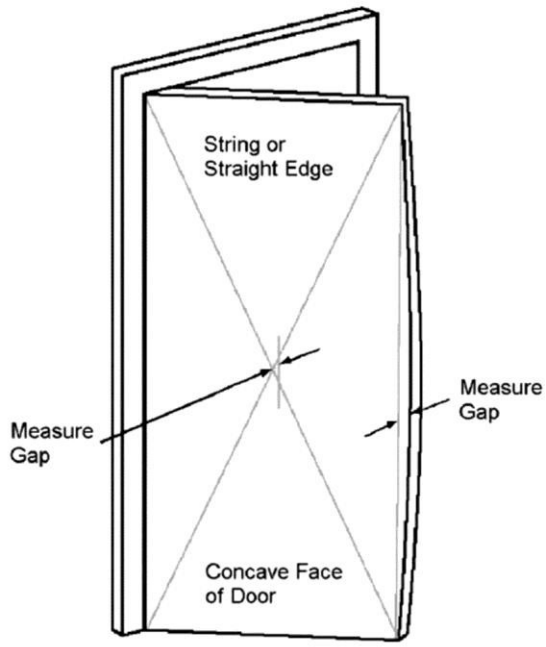
T-2: Flatness or Warp

Warp is a variation from a plane surface within the door itself. It does not refer to the door in relation to the frame or jamb in which it was hung. Bow, cup, and twist are terms used to describe the warp in a door.

Warp is usually a result of unequal stresses within the door from one face to the other caused by changes in humidity and temperature conditions or uneven conditions from one face to the other. Improper handling, stacking, and storage can also contribute to warp. See the Section on Job Site Information for specific recommendations.

HOW TO MEASURE WARP

Use a taut string or straight-edge and measure on the concave face of door – diagonally, horizontally, or vertically. Measure at the point of maximum distance between the taut string or straight-edge and the face of the door.



Door should be open when measuring for warp (lock not latched into strike).

One person can measure warp using a string and taping one or both endsonto the face of the door, holding ittaut.

Don't measure warp in relationship to the door frame.

Often a door may not fit into the frame properly but is not warped. In these cases, check the frame – it should be set plumb and square, and jambs should not be twisted or out of alignment.

Action on any claim for warp may be deferred for up to one year after project completion to permit doors to acclimate to temperature and humidity conditions.

ALLOWABLE WARP TOLERANCE FOR WOOD DOORS

44 mm (1-3/4 inch) or thicker doors:
1067 mm x 2134 mm (3'-6" x 7'-0") or smaller, 6.4 mm (1/4 inch) maximum.
Larger than 1067 mm x 2134 mm (3'-6" x 7'-0"), 6.4 mm (1/4 inch) maximum in any 1067 mm x 2134 mm (3'-6" x 7'-0") section.

35 mm (1-3/8 inch) doors:
914 mm x 2134 mm (3'-0" x 7'-0") or smaller, 6.4 mm (1/4 inch) maximum.
Larger sizes not addressed by this standard.

T-3: Squareness

All four corners of a door shall be square (right angles). Also, the length of the diagonal measurement on the face of the door from the upper right corner to the lower left corner shall be within 3.2 mm (1/8 inch) of the length of the diagonal from the upper left corner to the lower right corner.

T-4: Sanding

A product is sanded sufficiently smooth when knife cuts are removed and any remaining sanding marks are or will be concealed by applied finishing coats. For unfinished doors, handling marks and/or grain raising due to moisture or humidity in excess of the ranges set forth in this standard shall not be considered as a defect.

T-5: Joint Gaps

Maximum gaps between exposed components shall be tested with a feeler gauge at points designed to join where members contact or touch.

CONSTRUCTION

General

Solid Core Doors are customarily manufactured 44mm (1-3/4 inches) thick. However, other thicknesses are available, such as 35mm (1-3/8 inches), 50 mm (2 inches) and 57mm (2-1/4 inches).

Hollow Core Doors are customarily manufactured 35mm (1-3/8 inches) and 44mm (1-3/4 inches) thick. However, other thicknesses are available.

C-1: Face Requirements

Veneers for Transparent Finishes:

Species and grade shall be specified. In the absence of grade specifications, Custom grade will be furnished. All face veneers for transparent finish to meet requirements of Sections A-3 through A-8.

Face Materials for Opaque Finishes:

Premium Grade Doors:

Premium Grade Doors for opaque finishes to meet the requirements of Section A-2.

Custom Grade Doors:

Custom Grade Doors for opaque finishes to meet the requirements of Section A-2.

Door Skin Construction:

Door skins are typically constructed using composite crossbands, and are manufactured as 2-ply door components.

Materials for Laminate Faces:

High Pressure Decorative Laminates (HPDL) must meet minimum requirements of National Electrical Manufacturers Association (NEMA) Standard LD 3, High-Pressure Decorative Laminates.

C-2: Crossbanding Requirements

Crossbanding is permitted to be engineered wood products (composites).

C-3: Core Requirements

Below is a list of general core constructions used in wood flush doors. Other core can be used, providing the final door construction meets or exceeds the performance duty levels specified in Section P-1.

Particleboard Core (PC):

Wood fiber and/or agri-fiber based materials that comply with standard ANSI A208.1

Medium Density Fiberboard Core (MDFC):

Wood fiber and/or agri-fiber based materials that comply with ANSI A208.2.

Structural Composite Lumber Core (SCLC): An engineered wood product made by fusing a network of wood strands together to produce a strong, solid and stable product

Laminated Veneer Lumber Core (LVLC):

Manufactured by laminating veneer with all grain laid-up parallel, using various species of wood fiber in various thicknesses.

Fire Resistant Composite Core (FD):

Fire resistant composite core for fire doors per manufacturer's label service listing.

Hollow Core (HC):

Often made of expanded honeycomb made of corrugated fiberboard. The material and arrangement of interior core support items are intended to prevent telegraphing in compliance with Section T-1. Consult individual manufacturers for additional options.

Special Core Types:

Special core constructions applicable for Sound Resistant (STC), Lead Lined (X-ray) and Bullet Resistant, and Attack Resistant doors. Consult individual manufacturers for details.

C4: Edge Requirements

Vertical Edges (Stiles):

- Vertical edges may be constructed of solid wood, laminate, veneer or composite material, or combination thereof.
- Minimum requirements are established in Section C-11 and Section A-9.
- Minimum requirements are established in Section C-12. Veneer backing other than hardwood must be of a material that has been qualified in accordance with WDMA TM-15 Vertical Edge Impact Test Method.

Horizontal Edges (Rails):

- Solid wood or composite material meeting the minimum requirements of Section C-11 and Section A-9.
- Matching horizontal edges to stiles must be specified if required.
- Veneer backing other than hardwood must be of a material that has been qualified in accordance with WDMA TM-15 Vertical Edge Impact Test Method.

C-5: Vertical and Horizontal Edge/Core Interface

There are two types of interface between the core and the edges in solid core doors:

Bonded: Vertical and horizontal edges of solid core doors must be securely bonded to the core with adhesives.

Non-Bonded: Vertical and horizontal edges are not bonded to the core material. The maximum gap between core and vertical and/or horizontal edges is to be 0.8 mm (1/32 inch). Core and adjacent edging component thickness tolerance is +/- 0.13 mm (0.005 inch).

C-6: Adhesives

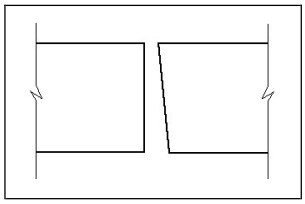
Glue lines for face veneer assembly, between the various plies of the face, between the facing and core assembly, and between edging and core in bonded core assemblies must be either Type I or Type II.

C-7: Construction Details

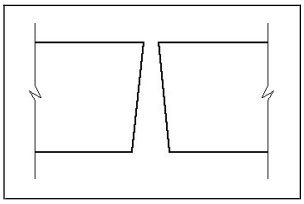
The following are illustrations of the most common meeting edge, Dutch door, transom meeting edge, glazing, louver, wood bead and blocking options that are available. Consult individual manufacturers for additional options.

Meeting Edge

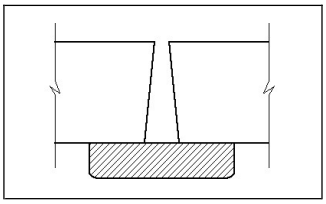
Specify by number



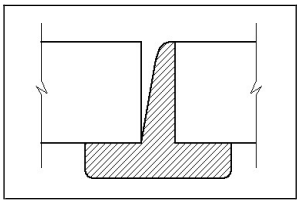
E1: One Bevel
(bevel active leaf)



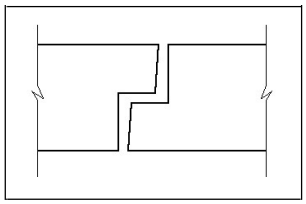
E2: Two Bevel



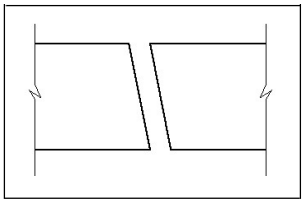
E3 Flat Astragal
(one or two bevel)



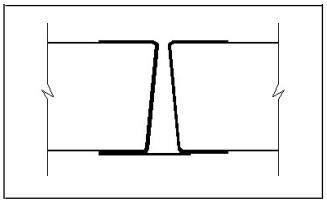
E4: Tee Astragal
(one or two bevel)



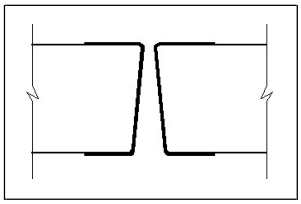
E5: Rabbeted
(bevel or square)



E6: Parallel Bevel
(double egress)



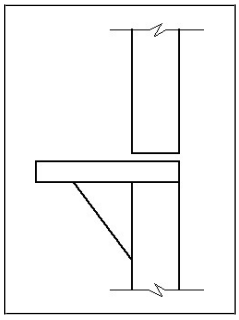
E7: Metal Edge Guard (bevel)
& Astragal (bevel
or square)



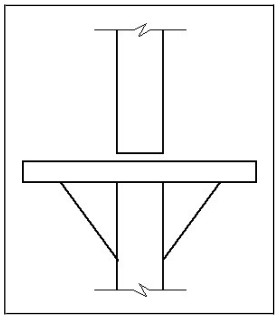
E8: Metal Edge Guard
(inactive edge
may be square)

Dutch Door

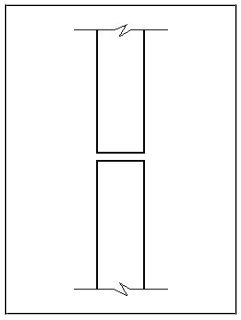
Specify by number



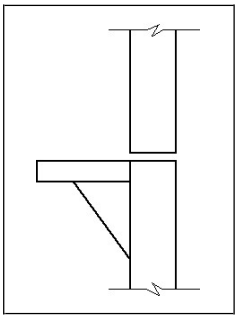
D1: One-Side Shelf



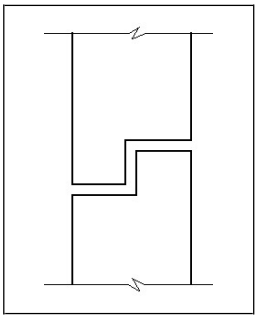
D2: Two-Side Shelf



D3: Non-Rabbeted



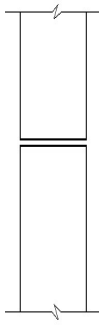
D4: Non-Rabbeted
with side shelf

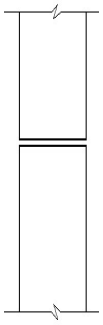


D5: Rabbeted

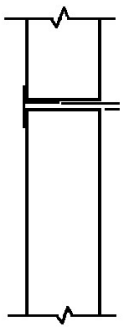
Transom Meeting Edge

Specify by number

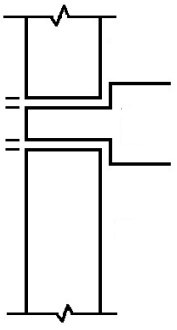




TM2:
Non-Rabbeted



TM3:
Astragal



TME4:
Transom Bar

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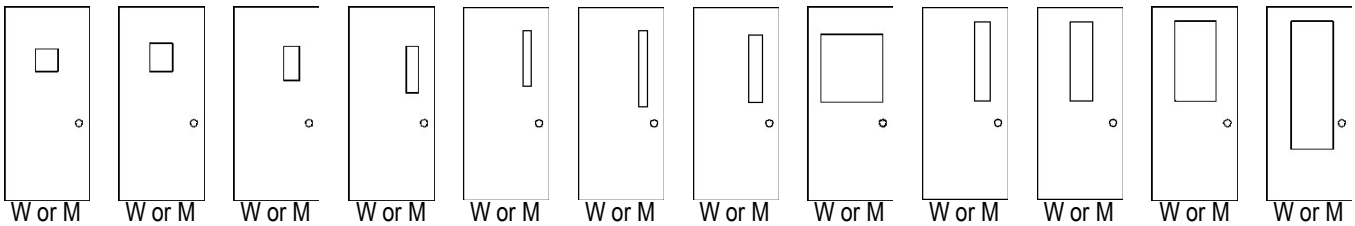
Glazing

Specify by number

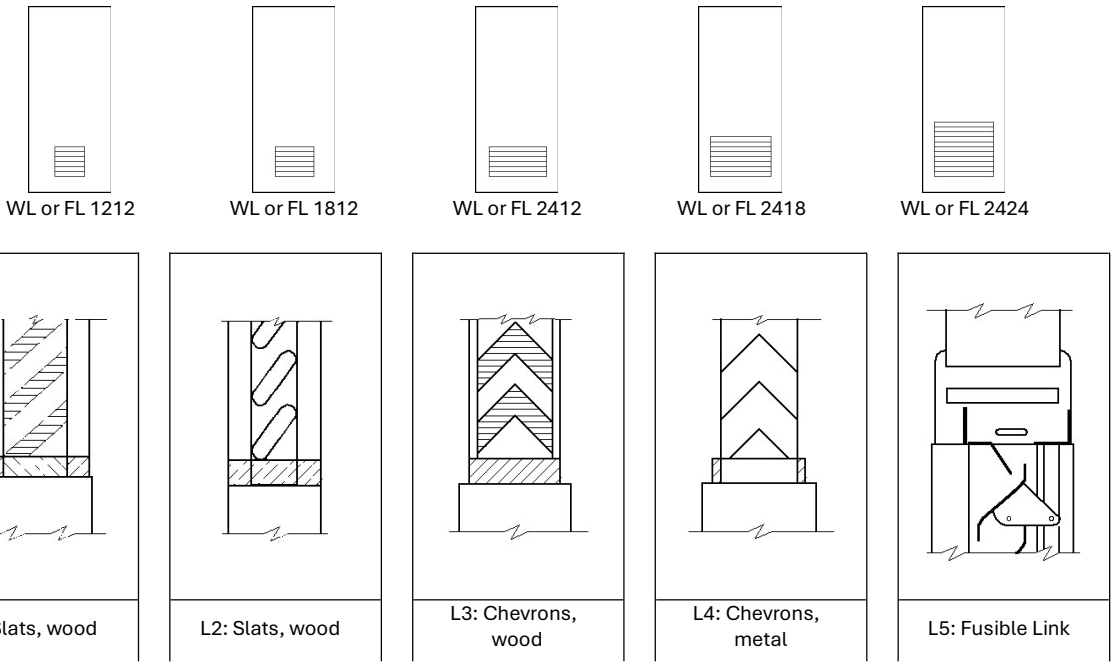


W = Wood
Moulding M = Metal Moulding
Number indicates size. For example, the industry reference of 2830 is a visible glass size of 28 inches wide x 30 inches high (711 mm x 762 mm).

Generally, cutouts in fire rated doors for metal or wood vision panels are a minimum of 140 mm (5-1/2 inches) from the vertical edge of the door or other cutouts; for non-fire rated doors, the distance is most commonly 127 mm (5 inches). Dimensions may vary depending on construction or manufacturer's warranty. Using a 254 mm (10 inches) margin between the edge of the door and the edge of any vision lite cutout near the lock area will eliminate most label and warranty conflicts.

Louver

Specify by number*



WL = Wood Louver
FL = Fusible Link Louver
Number indicates size. For example, the industry reference of 2412 is the louver opening size of 24 in. wide x 12 in. high (610 mm x 305 mm).

Louvers are not allowed in means-of-egress fire doors or 20-minute doors per NFPA 80,. Generally, fusible link louvers installed in 45, 60, and 90 minute fire rated doors must comply with individual fire door authorities and ADA requirements. Dimensions may vary depending on construction or manufacturer's warranty.

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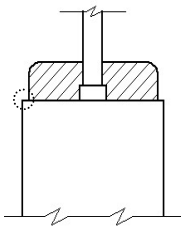
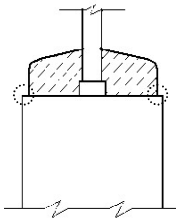
Vision Kit Options

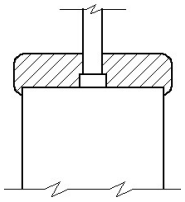
Specify by number



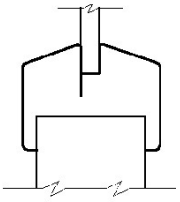
M1
Flush/Recessed
Wood Bead
(includes both fully
flush and
recessed styles)



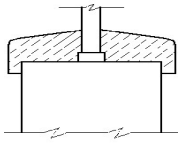
M2
Flush/Recessed
Wood Bead
(includes both fully
flush and
recessed styles)



M3
Wood



M4
Metal Vision
Frame



M5
Lip Bead

See Section C-11 for matching requirements. Specify transparent or opaque finish.
Bead shall be free of open defects, shake, splits, or doze.
Bead must be smooth and free of visible knife, saw, or sanding marks when viewed at a distance of 0.9 m (3 ft.) for premium grade and 1.8 m (6 ft.) for custom grade.
Some variances may occur in the fit of flush-type bead due to door thickness, moulding dimensions, machining characteristics and glazing material thickness. The glazier is responsible for the aesthetic appearance of the lite opening.
O - Due to tolerance variances between door components, flush bead may exhibit an inset or downset (see M1 and M2).

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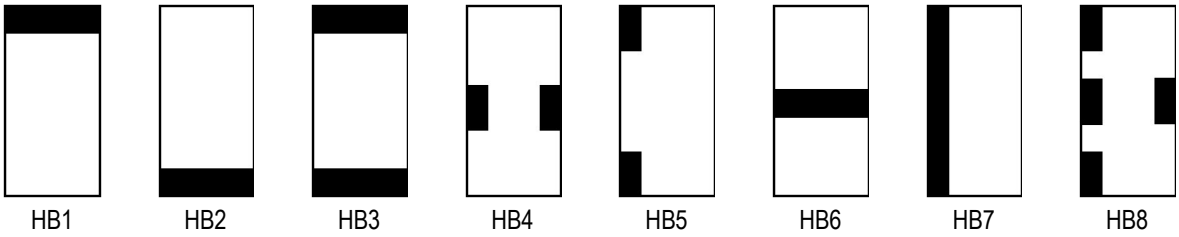
Hardware Blocking (Reinforcement) Options

When specifying a particular blocking pattern, specify by letter, location and dimension. Choosing more than one blocking option is permitted.



HB1 HB2 HB3 HB4 HB5 HB6 HB7 HB8

HB9 HB10 HB11 HB12

C-8: Fire Doors

Fire Door Ratings and Openings Classification

The model codes have established a fire door rating system for door assemblies that protect openings in fire resistant rated wall constructions. In 1997, the International Council of Building Officials (ICBO) approved a change to the Uniform Building Code (UBC) that requires fire doors to be tested under positive pressure instead of neutral pressure. Many states and local jurisdictions across the U.S. have adopted the International Building Code (IBC) which also contains therequirement for positive pressure.

It is very important that architects, contractors and distributors are aware of the requirements in their area so the appropriate type of door is supplied (neutral or positive pressure). Requirements for fire ratings and neutral or positive pressure depend upon local codes; door manufacturers are not responsible for interpretations of local code requirements. All fire doors must meet the requirements of recognized fire door tests and bear certifying labels of an independent testing agency approved by the building official.

Installation is required to be in accordance with the National Fire Protection Association's Publication NFPA 80, Standard for Fire Doors and Other Opening Protectives. Machined fire doors shall be provided with detailed installation instructions when doors bear a label indicating compliance to UL 10B or UL 10C.

Important Facts to Consider When Reading Specifications
(refer to current or adopted edition where applicable)

Key phrases indicating positive pressure	Key phrases indicating negative (neutral) pressure	Phrases that don't indicate either positive or negative pressure
• UBC 7-2-1997 – UBC Fire Test • International Building Code (IBC) • NFPA 5000 – Building Construction and Safety Code • UL 10C – Fire Test • After 5 minutes into the test the neutral pressure plane should be at 40 inches • Shall meet positive pressure requirements • Intumescent seals – not telling you it is positive pressure but implying that it is.	• UL 10B – Fire Test • UBC 7-2-1994 – UBC Fire Test • UBC 43-2 – UBC Fire Test • Tested at atmospheric pressure • Neutral pressure • Negative pressure	• NFPA 101 – Life Safety Code • NFPA 105 – Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives • NFPA 252 – Fire Test method which gives the option to be positive or negative • UBC – With no date given could be either positive or negative • UL 1784 – Air Leakage Test for Door Assemblies • NFPA 80 – Installation standard for fire doors

There are two categories of doors available for positive pressure fire openings.

Category A doors require no additional edge-sealing system. Doors included in this category have been evaluated without intumescent on either the frame or door, or the door has intumescent incorporated into the door by the door manufacturer.

Category B doors require additional edge-sealing system. Doors included in this category have been evaluated with intumescent applied to the frame surface, or incorporated into the frame by the frame manufacturer. Refer to the manufacturer's listings or installation instructions for meeting edge requirements, which may not require a field applied edge sealing system. Refer to the individual door listing and Category G, Edge-Sealing Systems for individual manufacturer's requirements.

Smoke and Draft Control Rating [S] (Category H) Many positive pressure openings will also require a smoke seal. An "S" label requirement indicates the opening needs to have Smoke and Draft Control Gasketing. Category H includes gasket systems that are surface-applied to the perimeter of the door or frame. They may be kerf applied, adhesive backed or mechanically attached. It includes gasketing for the meeting edges. This category covers gasket systems that have been evaluated for use in positive pressure rated assemblies but generally are not Category G.

Edge-Sealing Systems (Category G) Category G includes field applied systems only. Category G Edge-Sealing

Systems are for use on Category B doors, or meeting edges (only) of Category A doors. These systems are surface-applied to either the perimeter of the door or frame, or meeting edge of the door. They may be kerf-applied, adhesive- backed, or mechanically fastened.

Flame Spread Smoke Development

Model building codes do not usually require doors to comply with Flame Spread Smoke Development requirements. ASTM E 84 is the Standard Test Method for Surface Burning Characteristics of Building Materials. This test is used to evaluate building materials to assess how a fire may spread in the room of origin. The principle tests for evaluating fire doors (NFPA 252, UL10-B, UL10-C) aim to determine a door's ability to prevent a fire from spreading from the room of origin to an adjacent room or space.

Door Specification Descriptors

Section D-1 lists the different types of flush door constructions available in the industry. Fire rated flush doors for positive pressure openings are designated with the "PP" suffix. Stile and Rail doors as described by WDMA I.S. 6A are also available for positive pressure openings based on specific manufacturer's approvals.

Labeling and Listing

The U.S. model building codes require fire doors to be labeled. The label indicates the rating and is a permanent identifying mark attached to the door. Labeling on the door indicates compliance with the requirements of the certification organization. In addition to the door, the door frame, glazing and hardware are required to be labeled, or listed, for use with a specific fire door. NFPA 80 requires that all fire doors must be self-closing and self- latching.

C-9: Special Function Doors

Special Function doors are fabricated to meet specific functional criteria such as deterring sound, radiation, bullets, or attack from penetrating the opening. The design of the door to meet the product's purpose may impede its performance duty level as outlined in Section P-1 of this standard.

When specifying special function doors, it is the responsibility of the specification writer to outline all of the requirements within this standard for performance duty levels for the special function door.

Sound Resistant (STC)

Sound Resistant Doors are specified by the Sound Transmission Class (STC) ratings as determined by ASTM E90 and ASTM E413. These doors are certified by the manufacturer with regard to their sound resistance. The assigned STC rating shall reflect the operable value. To ensure acceptable sound resistance of the door, specifications shall indicate the operable STC rating that is required. Specifiers should be aware that in order to incorporate acoustical materials, door thickness may exceed nominal 44mm (1-3/4 inches) . Consult manufacturer for details of actual door thickness, gasketing, automatic door seals, thresholds, frames or hardware which may be required.

Lead Lined (X-ray)

Lead Lined doors are usually manufactured with a Particleboard, Structural Composite Lumber, or Fire Resistant Composite Core and have continuous lead sheet(s) from edge to edge in the center of the door or between the crossbanding and the core. The total thickness of the lead sheet(s) determines the shield rating. Various thicknesses of lead sheets are available.

Thickness		Corresponding	
0.8 mm	(1/32 inch)	0.9 kg	(2 lb.)
1.6 mm	(1/16 inch)	1.8 kg	(4 lb.)

3.2 mm	(1/8 inch)	3.6 kg	(8 lb.)
4.8 mm	(3/16 inch)	5.4 kg	(12 lb.)
6.4 mm	(1/4 inch)	7.3 kg	(16 lb.)

Bullet Resistant

Bullet resistant doors are manufactured with special ballistic rated materials within the core assembly. They are available to meet or exceed protection levels defined in UL 752 or NIJ. 0108.01 performance standards. When specifying bullet resistant doors, identify what protection level is required.

Attack Resistant

Attack resistant doors are tested and manufactured as a system including the door components, hollow metal frame, hardware, specific glass, glazing and metal lite kit assembly. They are available to meet or exceed protection levels defined in **ASTM F3561, Standard Test Method for Forced-Entry-Resistance of Fenestration Systems After Simulated Active Shooter Attack or FTD-SA, Shooter Attack Test Method**

When specifying attack resistant doors, identify what certification level of protection is required.

C-10: Environmental Doors

Flush wood doors have always been at the forefront of responsible use of our natural resources and many manufacturers offer doors that contribute to sustainable or high-performance building certification programs, such as LEED, Green Globes, Collaborative for High Performance Schools (CHPS) and other local and national programs.

Most doors are produced with pre-consumer recycled components and low emitting adhesives and binders. Doors can be supplied as chain of custody certified wood products through Forest Stewardship Council (FSC™), Sustainable Forestry Initiative (SFI) and other programs. In addition, manufacturers can supply Environmental Product Declaration (EPD), Health Product Declaration (HPD) and other certification documentation for their products.

WDMA does not publish or recommend any single sustainable or high-performance building standard or certification program. It is the responsibility of the specification writer to ensure the individual door manufacturer's products can contribute to the sustainable or high-performance building systems listed in the project specifications.

C-11: Face, Edge, Moulding and Transom Matching Standard

ANSI/WDMA I.S.1A Minimum Aesthetic Standards for Wood Veneer Faced Doors

DOOR FEATURES	Premium		Custom	
	Transparent Finish	**Opaque Finish**	**Transparent Finish**	**Opaque Finish**
Veneer Face	AA grade Veneer (A grade faces for Western Red Alder, White Pine, Douglas Fir and Redwood)	MDO, MDF, HDF or other high-density surface	A grade Veneer Edge glued joints	Closed-grain hardwood veneer, MDO, MDF, HDF or other high-density surface
Veneer Match	Book (default), Slip or Random Match	N/A	Book (default), Slip or Random Match	N/A
Veneer Face Assembly (default)	Center Balance. Outer leaves not less than 1/2 inch narrower than other leaves	N/A	Running	N/A
Optional Face Assembly	Other face assembly options are available, but must be specified	N/A	Other face assembly options are available, but must be specified. If Center Balance, outer leaves not less than 1 inch narrower than other leaves	N/A
Vertical Edges (Stile) (Exposed Surface)	Same Specie as Veneer Face* Solid or Veneered No Joints	Closed Grain Hardwood, Veneered, MDO, MDF, or HDF. No Joints	Compatible Specie to Veneer Face* One finger joint allowed if not visible from a distance of 1.2 m (4 feet)	Closed Grain Hardwood, Veneered, MDO,MDF, or HDF. One finger joint allowed if not visible from a distance of 1.2m (4 feet)
Horizontal Edges (Rail) (Semi-Exposed Surface)	Mill option. Same specie as veneer face. Veneered or hardwood, if specified.	Mill option for construction and fire rating.	Mill option. Compatible specie to veneer face. Veneered or hardwood, if specified.	Mill option for construction and fire rating.
Sanding	See Section T-			
Joint Gaps, T-5	Shall not exceed 0.3 mm (0.012) inch in width at flat surfaces, nor more than 0.65 mm (0.025 inch) at shaped surfaces.		Shall not exceed 0.65 mm (0.025 inch) in width at flat surfaces, nor more than 1.3 mm (0.050 inch) at shaped surfaces.	
Solid Wood Components Lites, Louvers, Mouldings, etc.	Same Specie as Veneer Face* Solid or Veneered, or the same material as the face No Joints	Closed Grain Hardwood. Solid or Veneered, or the same material as the face	Compatible Specie to Veneer Face* Solid or Veneered, or the same material as the face	Closed Grain Hardwood Solid or Veneered, or the same material as the face

* Birch or exotic species faced doors shall be permitted to use compatible species edges, lites, and moulding due to scarcity of matching lumber.

Note: Refer to section A-1 for information on grain and color variation.

ANSI/WDMA I.S.1A Minimum Aesthetic Standards for Laminate Faced Doors

DOOR	Premium		Custom	
Finish Type	**Woodgrains**	**Solid Colors or Patterns**	**Woodgrains**	**Solid Colors or Patterns**
High Pressure Decorative Laminate Face	Meets or exceeds NEMA LD-3	Meets or exceeds NEMA LD-3	Meets or exceeds NEMA LD-3	Meets or exceeds NEMA LD-3
Pairs and Sets	Matching not available	N/A	Matching not available	N/A
Vertical edges (visible surface)	Matching HPDL or PVC or Compatible Species Solid Lumber or Veneered (a)	Matching HPDL or PVC or Compatible Species Solid Lumber or Veneered (a)	Matching HPDL or PVC or Compatible Species Solid Lumber or Veneered (a)	Matching HPDL or PVC or Compatible Species Solid Lumber or Veneered (a)
Wood Mouldings (lites, louvers, etc.)	Compatible Species Solid Lumber or Veneered (a)	Compatible Species Solid Lumber or Veneered (a)	Compatible Species Solid Lumber or Veneered (a)	Compatible Species Solid Lumber or Veneered (a)
Doors/Transoms	Door and Transom Grain Continuous Match (b)	N/A	Door and Transom Grain Continuous Match (b)	N/A
Transom Meeting Edges – TME2 (full width of door/transom)	Matching HPDL or PVC or Compatible Species Solid Lumber (a)	Matching HPDL or PVC or Compatible Species Solid Lumber (a)	Matching HPDL or PVC or Compatible Species Solid Lumber (a)	Matching HPDL or PVC or Compatible Species Solid Lumber (a)
Options for transom bottom edge. Must be specified if desired.				
Optional bottom edge: for transoms option T1 & T2 (full width of door/transom)	Compatible Species with Transparent (stain) Finish (a)	Close Grain Hardwood with Paint Finish (a)	Compatible Species with Transparent (stain) Finish (a)	Close Grain Hardwood with Paint Finish (a)

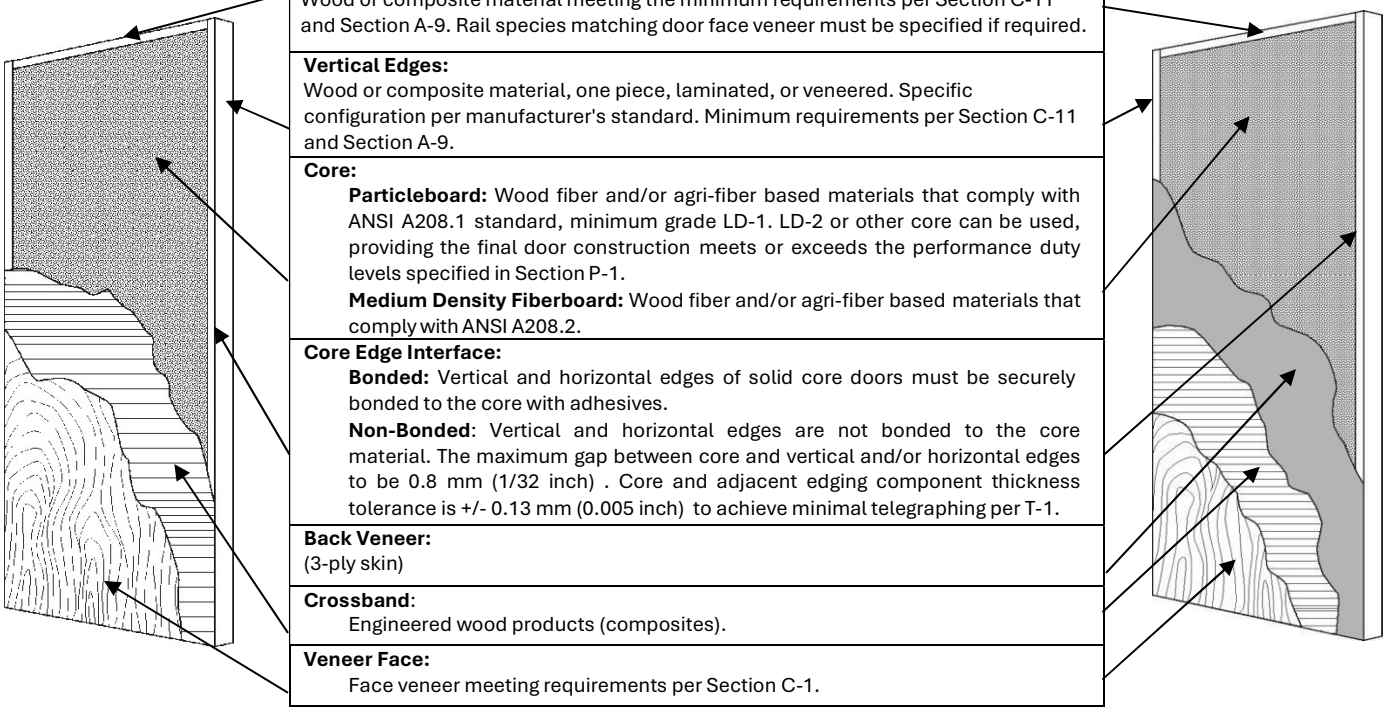
Note:
Finish for edges and wood mouldings to be compatible color.
If not restricted by product availability.

C-12 Door Construction Detail

Wood Veneer Particleboard Core

PC-5 Bonded
FPC-5 Non-Bonded

PC-7 Bonded
FPC-7 Non-Bonded



Top and Bottom Horizontal Edges:
Wood or composite material meeting the minimum requirements per Section C-11 and Section A-9. Rail species matching door face veneer must be specified if required.

Vertical Edges:
Wood or composite material, one piece, laminated, or veneered. Specific configuration per manufacturer's standard. Minimum requirements per Section C-11 and Section A-9.

Core:
Particleboard: Wood fiber and/or agri-fiber based materials that comply with ANSI A208.1 standard, minimum grade LD-1. LD-2 or other core can be used, providing the final door construction meets or exceeds the performance duty levels specified in Section P-1.
Medium Density Fiberboard: Wood fiber and/or agri-fiber based materials that comply with ANSI A208.2.

Core Edge Interface:
Bonded: Vertical and horizontal edges of solid core doors must be securely bonded to the core with adhesives.
Non-Bonded: Vertical and horizontal edges are not bonded to the core material. The maximum gap between core and vertical and/or horizontal edges to be 0.8 mm (1/32 inch) . Core and adjacent edging component thickness tolerance is +/- 0.13 mm (0.005 inch) to achieve minimal telegraphing per T-1.

Back Veneer:
(3-ply skin)

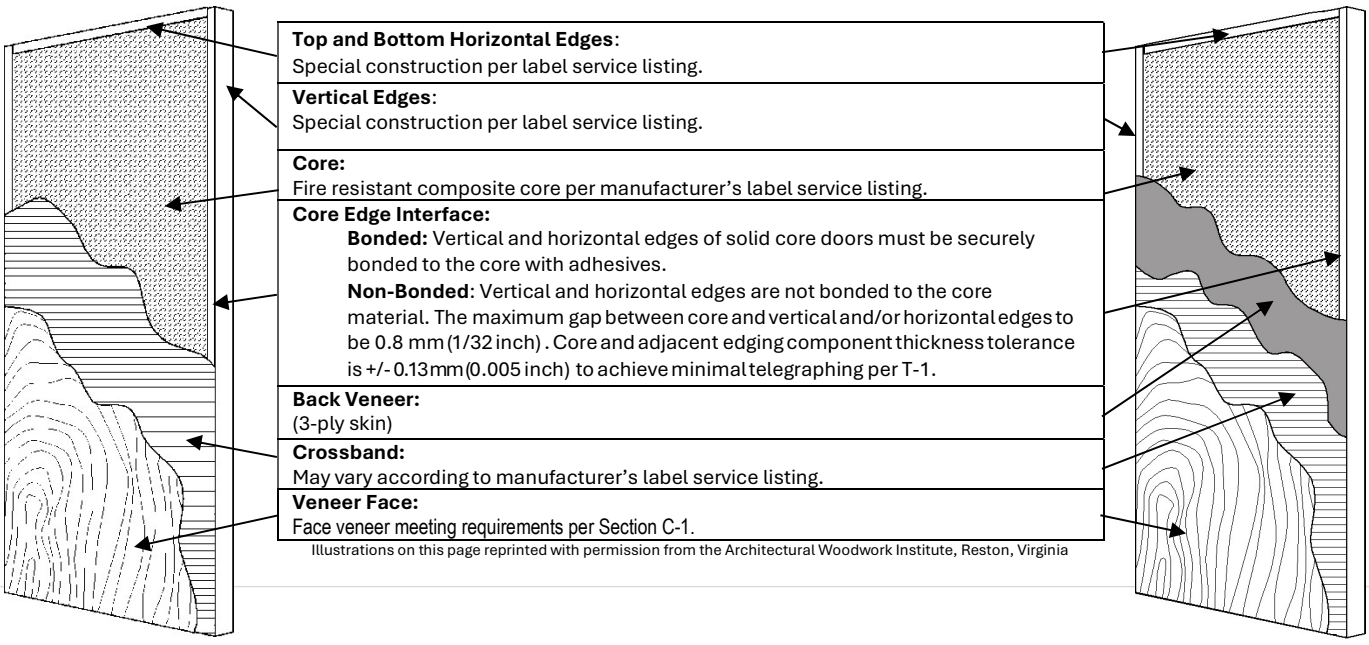
Crossband:
Engineered wood products (composites).

Veneer Face:
Face veneer meeting requirements per Section C-1.

Wood Veneer Fire Resistant Composite Core

FD-45-5, 60-5, 90-5
FD-45PP-5, 60PP-5, 90PP-5

FD-45-7, 60-7, 90-7
FD-45PP-7, 60PP-7, 90PP-7



Top and Bottom Horizontal Edges:
Special construction per label service listing.

Vertical Edges:
Special construction per label service listing.

Core:
Fire resistant composite core per manufacturer's label service listing.

Core Edge Interface:
Bonded: Vertical and horizontal edges of solid core doors must be securely bonded to the core with adhesives.
Non-Bonded: Vertical and horizontal edges are not bonded to the core material. The maximum gap between core and vertical and/or horizontal edges to be 0.8 mm (1/32 inch) . Core and adjacent edging component thickness tolerance is +/- 0.13mm (0.005 inch) to achieve minimal telegraphing per T-1.

Back Veneer:
(3-ply skin)

Crossband:
May vary according to manufacturer's label service listing.

Veneer Face:
Face veneer meeting requirements per Section C-1.

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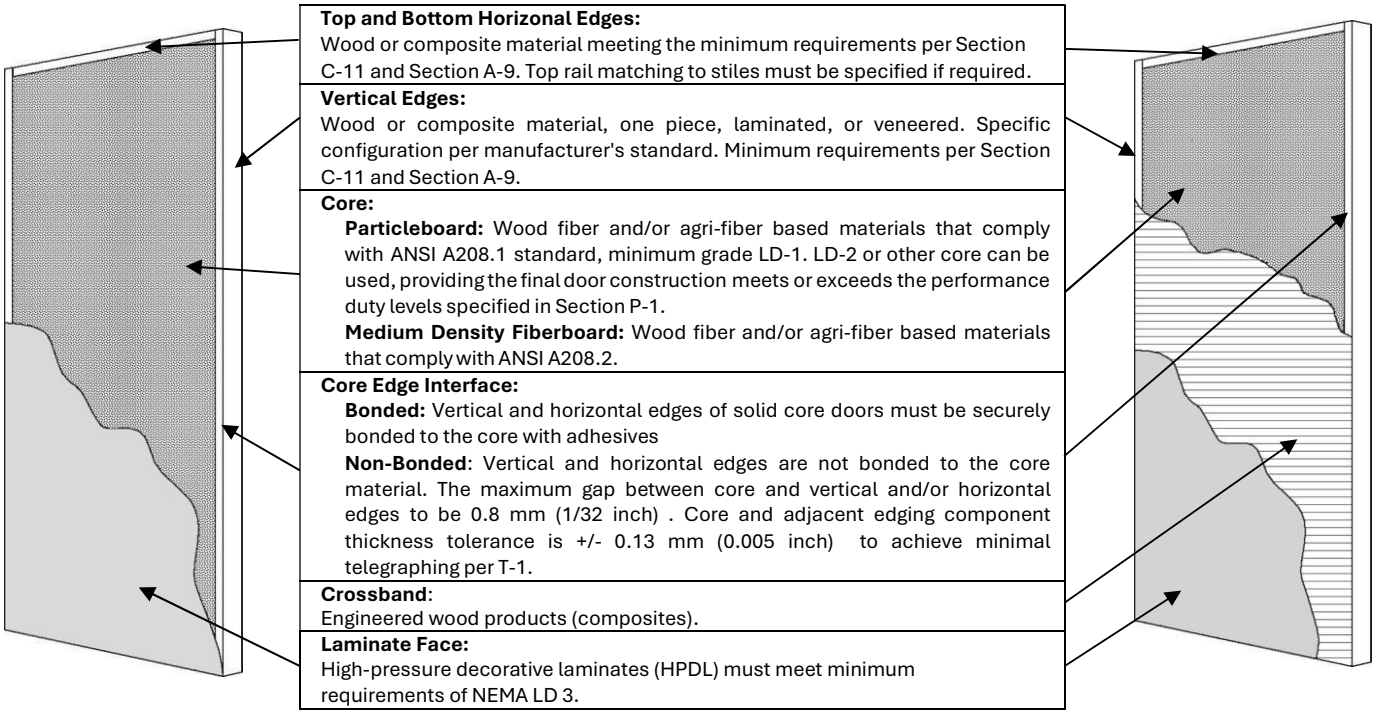
HPDL Particleboard Core

PC-HPDL-3 Bonded
FPC-HPDL-3 Non-Bonded

PC-HPDL-5 Bonded
FPC-HPDL-5 Non-Bonded



Top and Bottom Horizonal Edges:
Wood or composite material meeting the minimum requirements per Section C-11 and Section A-9. Top rail matching to stiles must be specified if required.

Vertical Edges:
Wood or composite material, one piece, laminated, or veneered. Specific configuration per manufacturer's standard. Minimum requirements per Section C-11 and Section A-9.

Core:
Particleboard: Wood fiber and/or agri-fiber based materials that comply with ANSI A208.1 standard, minimum grade LD-1. LD-2 or other core can be used, providing the final door construction meets or exceeds the performance duty levels specified in Section P-1.
Medium Density Fiberboard: Wood fiber and/or agri-fiber based materials that comply with ANSI A208.2.

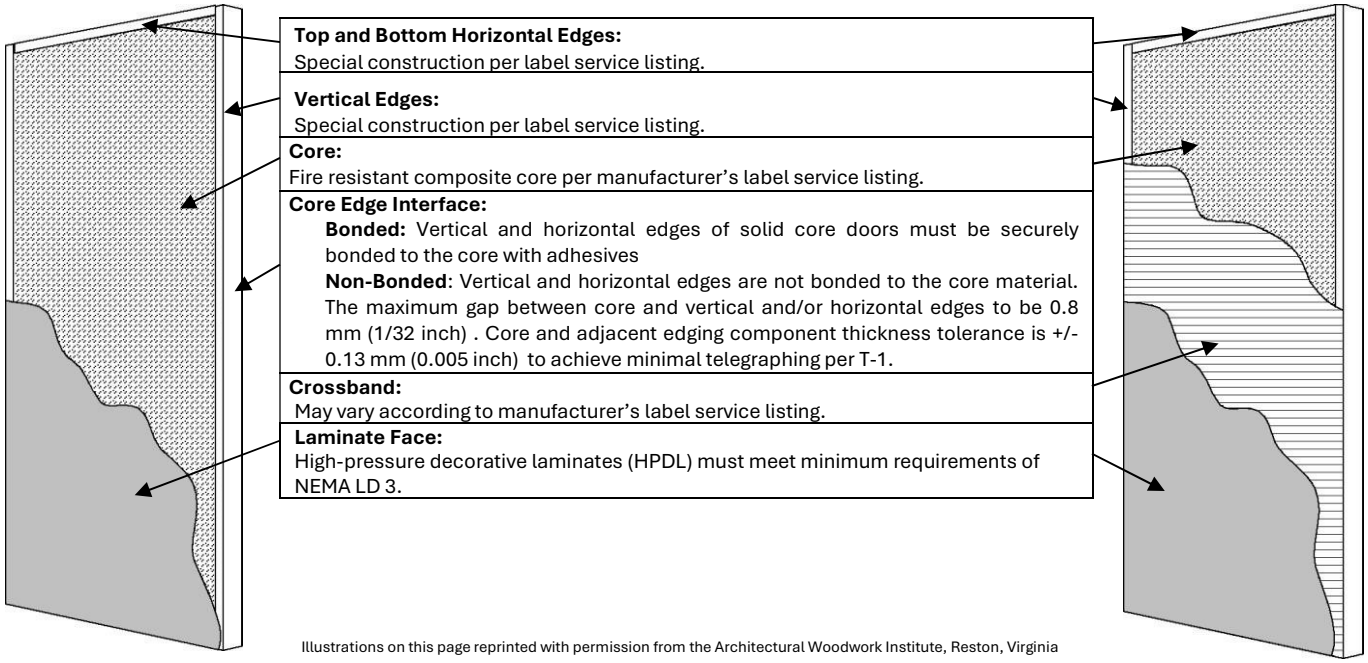
Core Edge Interface:
Bonded: Vertical and horizontal edges of solid core doors must be securely bonded to the core with adhesives
Non-Bonded: Vertical and horizontal edges are not bonded to the core material. The maximum gap between core and vertical and/or horizontal edges to be 0.8 mm (1/32 inch) . Core and adjacent edging component thickness tolerance is +/- 0.13 mm (0.005 inch) to achieve minimal telegraphing per T-1.

Crossband:
Engineered wood products (composites).

Laminate Face:
High-pressure decorative laminates (HPDL) must meet minimum requirements of NEMA LD 3.

HPDL Fire Resistant Composite Core

FD-45-HPDL-5, 60-5, 90-5
FD-45PP-HPDL-5, 60PP-5, 90PP-5



Top and Bottom Horizontal Edges:
Special construction per label service listing.

Vertical Edges:
Special construction per label service listing.

Core:
Fire resistant composite core per manufacturer's label service listing.

Core Edge Interface:
Bonded: Vertical and horizontal edges of solid core doors must be securely bonded to the core with adhesives
Non-Bonded: Vertical and horizontal edges are not bonded to the core material. The maximum gap between core and vertical and/or horizontal edges to be 0.8 mm (1/32 inch) . Core and adjacent edging component thickness tolerance is +/- 0.13 mm (0.005 inch) to achieve minimal telegraphing per T-1.

Crossband:
May vary according to manufacturer's label service listing.

Laminate Face:
High-pressure decorative laminates (HPDL) must meet minimum requirements of NEMA LD 3.

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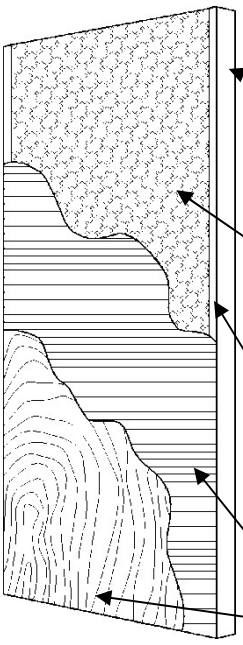
Wood Veneer Structural Composite Lumber Core

SCLC-5 Bonded
FSCLC-5 Non-Bonded

SCLC-7 Bonded
FSCLC-7 Non-Bonded



Vertical Edges:

Wood or composite material, one piece, laminated, or veneered. Specific configuration per manufacturer's standard. Minimum requirements per Section C-11 and Section A-9. Finger joints are not permitted in Premium Grade. One finger joint is permitted in Custom Grade at each veneer edge that is tight, not raised, uniform in color and grain, without discoloration, and is not visible at a distance of 1.2 m (4-feet).

Core:
An engineered wood product that is made by fusing a network of wood strands together with a water-resistant adhesive to product a strong, solid, and stable product.

Core Edge Interface:

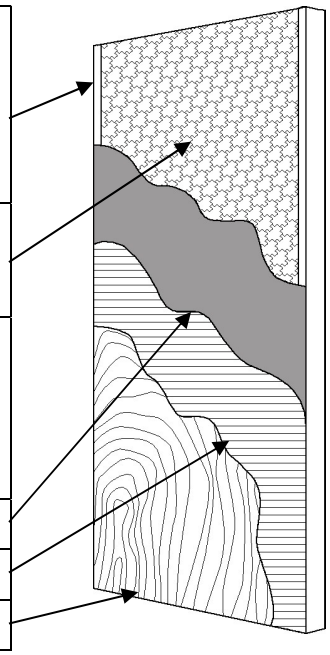
Bonded: Vertical and horizontal edges of solid core doors must be securely bonded to the core with adhesives

Non-Bonded: Vertical and horizontal edges are not bonded to the core material. The maximum gap between core and vertical and/or horizontal edges to be 0.8 mm (1/32 inch) . Core and adjacent edging component thickness tolerance is +/- 0.13 mm (0.005 inch) to achieve minimal telegraphing per T-1.

Back Veneer: (3-ply skin)

Crossband:
Crossband may be wood veneer or engineered wood products (composites).

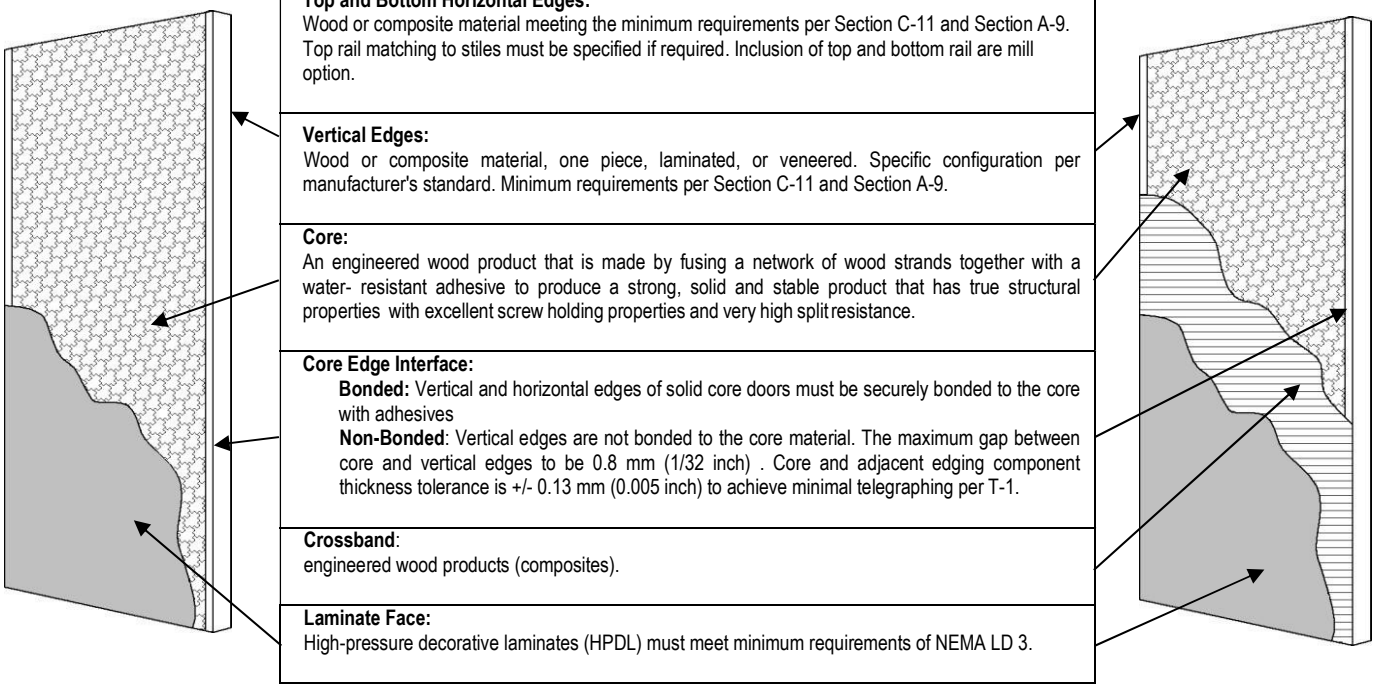
Veneer Face:
Face veneer meeting requirements per Section C-1.



HPDL Structural Composite Lumber Core

SCLC-HPDL-3 Bonded
FSCLC-HPDL-3 Non-Bonded

SCLC-HPDL-5 Bonded
FSCLC-HPDL-5 Non-Bonded



Top and Bottom Horizontal Edges:
Wood or composite material meeting the minimum requirements per Section C-11 and Section A-9. Top rail matching to stiles must be specified if required. Inclusion of top and bottom rail are mill option.

Vertical Edges:
Wood or composite material, one piece, laminated, or veneered. Specific configuration per manufacturer's standard. Minimum requirements per Section C-11 and Section A-9.

Core:
An engineered wood product that is made by fusing a network of wood strands together with a water- resistant adhesive to produce a strong, solid and stable product that has true structural properties with excellent screw holding properties and very high split resistance.

Core Edge Interface:

Bonded: Vertical and horizontal edges of solid core doors must be securely bonded to the core with adhesives

Non-Bonded: Vertical edges are not bonded to the core material. The maximum gap between core and vertical edges to be 0.8 mm (1/32 inch) . Core and adjacent edging component thickness tolerance is +/- 0.13 mm (0.005 inch) to achieve minimal telegraphing per T-1.

Crossband:
engineered wood products (composites).

Laminate Face:
High-pressure decorative laminates (HPDL) must meet minimum requirements of NEMA LD 3.

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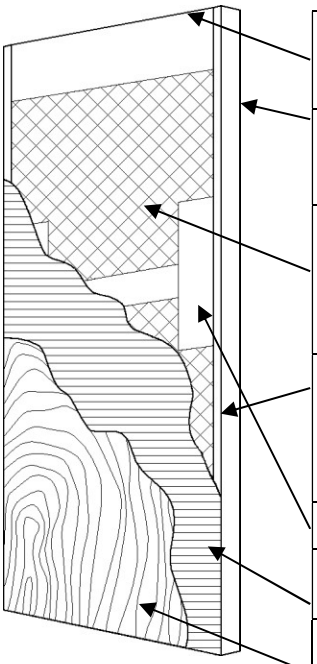
Wood Veneer or HPDL Hollow Core

FSHC-5
Standard



Top and Bottom Horizontal Edges:
Wood or composite material, meeting the minimum requirements per Section C-11 and Section A-9. End rail surface material matching to stiles must be specified if required.

Vertical Edges:
Wood or composite material, one piece, laminated, or veneered. Specific configuration per manufacturer's standard. Minimum requirements per Section C-11 and Section A-9.

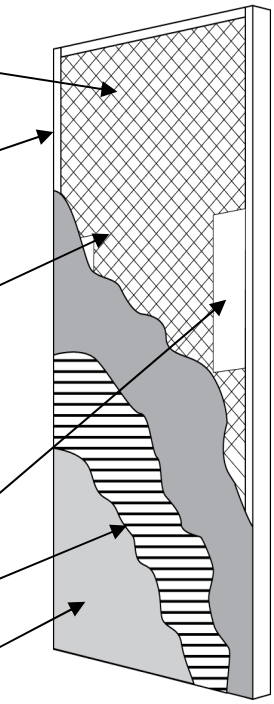
Core:
Often made of expanded honeycomb made of corrugated fiberboard (illustrated). Consult individual manufacturers for additional options. The material and arrangement of interior core support items are intended to prevent telegraphing in compliance with Section T-1.

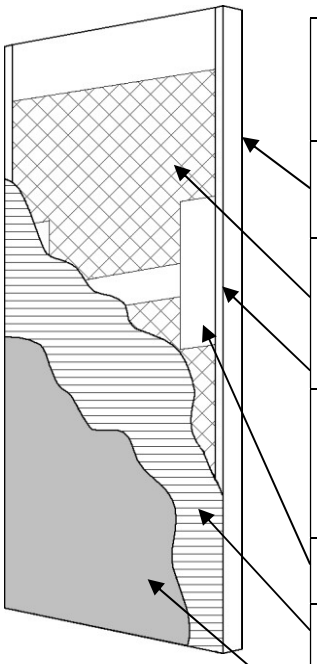
Core Edge Interface:
Non-Bonded: Vertical and horizontal edges are not bonded to the core material. The maximum gap between core and vertical and/or horizontal edges to be 0.8 mm (1/32 inch) . Core and adjacent edging component thickness tolerance is +/- 0.13 mm (0.005 inch) to achieve minimal telegraphing per T-1.

Blocking Reinforcement: Inclusion of blocking and material is mill option.

Crossband:
Engineered wood products (composites).

Veneer Face:
Face veneer meeting requirements per Section C-1





Top and Bottom Horizontal Edges:
Wood or composite material, meeting the minimum requirements per Section C-11 and Section A-9. End rail surface material matching to stiles must be specified if required.

Vertical Edges:
Wood or composite material, one piece, laminated, or veneered. Specific configuration per manufacturer's standard. Minimum requirements per Section C-11 and Section A-9.

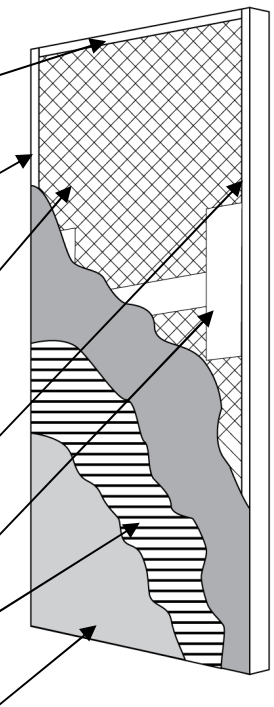
Core:
Often made of expanded honeycomb made of corrugated fiberboard (illustrated). Consult individual manufacturers for additional options. The material and arrangement of interior core support items are intended to prevent telegraphing in compliance with Section T-1.

Core Edge Interface:
Non-Bonded: Vertical and horizontal edges are not bonded to the core material. The maximum gap between core and vertical and/or horizontal edges to be 0.8 mm (1/32 inch) . Core and adjacent edging component thickness tolerance is +/- 0.13 mm (0.005 inch) to achieve minimal telegraphing per T-1.

Blocking Reinforcement:

Crossband:
Engineered wood products (composites).

Laminate Face:
High-pressure decorative laminates (HPDL) must meet minimum requirements of NEMA LD 3



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FINISHING

General

Finishes described in this Section are intended for interior applications only. Finishes protect wood from moisture, handling, and harsh chemicals. The sooner moisture is restricted from entering or leaving, the longer wood lasts and the finer it looks. It should be noted, however, that finishing only retards moisture penetration, it will not prevent it.

Transparent finishes allow the substrate to remain visible. Transparent finishes provide the architect or designer an opportunity to create a striking visual effect by modifying the color, look, and sheen of the door. Opaque finishes protect the wood and provide a solid color painted appearance.

A finish shall be applied to flush wood doors in the controlled environment of the door manufacturer's plant, or it shall be applied in the field by a painting contractor.

The majority of architectural wood doors are now finished at the factory as opposed to the jobsite. It is highly recommended that specifications require factory finishing to achieve the best overall door appearance and durability.

F1: Factory Finishing

Factory finishing is generally specified when a project requires high quality performance and superior appearance. Factory finishing offers many benefits.

- Factory finishing utilizes state-of-the-art equipment in a dust-free environment providing uniform color, texture, and sheen - conditions normally unavailable in the field. Factory finish does not guarantee to make uniform the natural variation in color of the unfinished veneer (reference Section F-4). If consistent door color range is required, veneer color and grain range must be specified.
- Often in field finishing, numerous limitations prevent proper sanding. If improperly sanded, a door lacks the clarity of finish and uniformity of color that is achieved by factory finishing.
- Factory finishing provides adequate drying time in a dust free environment.
- Door manufacturing facilities are subject to strict State and Federal environmental standards which result in the proper handling, application, and disposal of finishing materials. Specifying factory finish improves environmental compliance.
- Factory finishing ensures that wood is protected from unfavorable moisture conditions at the earliest possible time.
- In most cases, the cost of factory finishing is lower than the cost of using a separate finishing contractor.
- Factory finished doors can immediately be installed after delivery, which means faster project completion.

F-2: Finish Selection

Normally, door manufacturers will only supply their standard finishing system. The factory finishing information provided by the specified door manufacturer should be consulted before specifying the type and extent of finishing desired.

Section P1 of this standard identifies varying minimum finish systems for doors based on their performance duty level. However, many door manufacturers supply a TR-6/OP-6 or TR-8/OP-8 finish system as their standard finish regardless of duty level. These systems provide the highest levels of wear and chemical resistance at an economical cost. Other systems are available, based on individual door manufacturer’s processes and policies.

Non-standard stain colors to match architect's selection are available from most manufacturers. Some manufacturers may offer more than one finish system or grain textures (i.e., open grain or filled grain). Specifying non-standard finishes may increase the cost over standard finishes and increase lead times. Should special door finishes be desired, they must be fully described in the specifications.

Since appearance and other finish characteristics are somewhat subjective, just the selection of a finishing system does not ensure that the final finish will be acceptable. Selection of a finish should be based on physical samples provided by the door manufacturer.

F-3: Finish System Description

A variety of wood finishes are available, from single stains to multi-step processes. When selecting a finish, consider the desired appearance, exposure, and maintenance it will require.

By identifying a particular finish system, an expectation of performance characteristics for the factory finish is established. There are eight finishing systems that are commonly referenced for architectural wood flush doors. These are:
TR-2 & OP-2 (Pre or Post Catalyzed Lacquer)

TR-4 & OP-4 (Conversion Varnish)

TR-6 & OP-6 (Catalyzed Polyurethanes)

TR-8 & OP-8 (UV Cured Acrylated Polyester/Urethanes)

The performance levels established by specifying one of these systems are found in the table located in Section F-7. Finish performance levels can also be specified by referencing the duty level identified in table P-1: Performance Standard for Architectural Wood Flush Doors. Unless otherwise specified, manufacturers will furnish their standard finish system.

This standard is not an attempt to identify all available finish systems, or to limit the types of finishes which may be offered by door manufacturers. Other formulations may exhibit similar performance characteristics as the systems described in this Section, but must meet or exceed the performance levels for the system specified to be considered as equal. Also, the listing of a finish system in this standard does not imply compliance with the requirement of Local and/or Federal Environmental Protection Agencies.

Finishes are available in different bases and curing methods. The basic types are solvent, water reducible or ultra violet cure. Solvent bases cure by the evaporation of volatile organic compounds (VOC's) into the atmosphere and their use is regulated by environmental agencies. Water base systems evaporate water for curing. Ultra violet (UV) finishes are cured using light to create a chemical reaction within the finishing material. UV finishes are typically the most environmentally friendly of the systems used for architectural door production finishing.

Common finishing systems used by many door manufacturers are described below. "TR" indicates a transparent finish, while "OP" indicates an opaque finish.TR-2 & OP-2 Pre- or Post Catalyzed Lacquer

Catalyzed lacquer systems contain an ingredient for faster drying and harder film. They have the strength and higher solids of conversion coatings. Vinyl lacquer systems are catalyzed lacquers that have a vinyl resin rather than a nitrocellulose base. Pre-catalyzed lacquers have the catalyst mixed in by the finish manufacturer, while post-catalyzed lacquers require the finisher to add the catalyst just before application.

TR-4 & OP-4 Conversion Varnish

Conversion varnish is a high solids catalyzed alkyd based coating, offering high resistance to chemicals, moisture, and scratches. Similar in composition to catalyzed lacquer, except for nitrocellulose, the solids in this finish make it economical. One coat of conversion varnish can equal two coats of lacquer. Conversion varnishes are also available in waterborneformulations.

TR-6 & OP-6 Catalyzed Polyurethane

Catalyzed polyurethanes have higher solids content than lacquers and provide high build and excellent hardness, providing one of the highest chemical wear and impact resistance ratings of all available finishes. These finishes are very durable and offer excellent chemical, mar, and impact resistance. Many door manufacturers provide a catalyzed polyurethane system that is cured using ultraviolet (UV) technology.

TR-8 & OP-8 UV Cured Acrylated Polyester/Urethane

Since polyesters have strong filling, build, leveling, and hardness traits, they can be combined with polyurethanes to achieve high gloss and endurance. This finish system excels in appearance, burnish, texture, and overall durability and is the highest rated performance of all the standard door finish systems.

F-4: Sample Submission

Door manufacturers shall provide standard colors for selection.

To specify non-standard colors and sheens, the architect is to provide two or more samples at least 8 inches x 8 inches (200 x 200 mm) showing the desired effect on the wood species and cut of veneer to be used.

Samples are to bear identification of the project and door manufacturer . The door manufacturer shall be permitted to submit samples in sets of two or more, illustrating the natural characteristics and color variations (see Aesthetics). Exposure to sunlight and ultraviolet light will cause changes in wood by accelerating bleaching and oxidation. Approved finish samples must be covered and protected from effects of light during the period between approval and delivery of the finished doors. Verify color samples are current and not aged.

Variations in color and appearance can be expected due to the nature of wood. Barber pole effect in book matched veneers is not a defect, but is a result of tight and loose sides of veneer created during the slicing process. This can affect color from veneer leaf to veneer leaf within a door face because of light reflection and stain absorption.

Color variation from door to door due to veneers from different logs, color variation within veneers from the same log, and variations from heartwood and sapwood, can also cause differences in appearance from door to door and are acceptable in standard door grades. Specification of uniform color and grain or flitch selection can narrow color variation.

Some veneers are susceptible to grain variations (typically end grain) which can cause a blotchy or uneven color appearance. The darker the stain, the more prevalent the variation can be. Veneers that are more likely to exhibit this effect are Birch and Maple, although it can present itself in any species. Proper sanding can reduce, but not entirely eliminate, the contrast in color.

F-5: Job Site Finishing

Because of the many uncontrollable variables that exist at a job site, such as temperature, dust and other factors, door manufacturers' warranties do not cover the appearance of finishes applied in the field. See Section J-3 for information on field finishing.

F-6: Visual Inspection Standards

Architectural flush door faces sometimes require touch up due to natural, manufacturing or installation marks. The chart below outlines the allowable defects based on visual inspection from a prescribed distance.

Factory finished doors must be final inspected in the vertical position, at the opening, viewed underlighting identical to final job site conditions, prior to installation.		
Defect	**Premium Grade**	**Custom Grade**
Glue Spots	Not permitted	Not permitted
Fine Sanding Scratches	Not permitted	Not noticeable at 0.9 m (3 feet)
Finish runs, orange peel, blisters, blushing, cracking, sags or checking	Not permitted	Not permitted
Filled holes or splits	Not noticeable at 0.9 m (3 feet)	Not noticeable at 1.8 m (6 feet)

Repair or touch-up	Not noticeable at 0.9 m (3 feet)	Not noticeable at 1.8 m (6 feet)

F-7: Standard Wood Door Finish System Ratings

The ratings described in the following chart indicate overall performance scores to provide the specifier with a guide to select the system that meets the resistance needs of the project. These systems are those typically available from architectural door manufacturers. Other systems may be available upon request, subject to individual manufacturer's capabilities. Specify system number and chemical description for clarity, i.e., TR-6 Catalyzed Polyurethane.

CHEMICAL / WEAR	SYSTEM NAME / NUMBER							
	Catalyzed Lacquer		Conversion Varnish		Catalyzed Polyurethane		UV Cured Acrylated Polyester/Urethane	
	Transparent	Opaque	Transparent	Opaque	Transparent	Opaque	Transparent	Opaque
	TR-2	OP-2	TR-4	OP-4	TR-6	OP-6	TR-8	OP-8
Vinegar	5	5	5	5	5	5	5	5
Lemon Juice	5	5	5	5	5	5	5	5
Orange Juice	5	5	5	5	5	5	5	5
Catsup	5	5	5	5	5	5	5	5
Coffee	5	5	5	5	5	5	5	5
Olive Oil	5	5	5	5	5	5	5	5
Boiling Water	5	5	5	5	5	5	5	5
Cold Water	5	5	5	5	5	5	5	5
Nail Polish Remover	3	3	4	4	4	4	5	5
Household Ammonia	5	5	5	5	5	5	5	5
VM&P Naphtha	5	5	5	5	5	5	5	5
Isopropyl Alcohol	3	3	5	5	5	5	5	5
Wine	5	5	5	5	5	5	5	5
Windex ™	4	4	5	5	5	5	5	5
409 Cleaner ™	4	4	5	5	5	5	5	5
Lysol ™	5	5	5	5	5	5	5	5
33% Sulfuric Acid	5	5	5	5	5	5	5	5
77% Sulfuric Acid	3	3	1	1	4	4	4	4
28% Ammonium	3	3	5	5	5	5	5	5
Gasoline	5	5	5	5	5	5	5	5
Murphy's Oil Soap ™	5	5	5	5	5	5	5	5
Vodka 100 Proof	5	5	5	5	5	5	5	5
1% Detergent	5	5	5	5	5	5	5	5
10% TSP	5	5	4	4	5	5	5	5
TOTAL	**110**	**110**	**114**	**114**	**118**	**118**	**119**	**119**
Wear Index	4	3	5	5	5	4	5	4
Cold Check	5	5	5	5	5	5	5	5
Adhesion	5	5	5	5	5	5	5	5
SCORE	**124**	**123**	**129**	**129**	**133**	**132**	**134**	**133**

The chemical and wear resistance characteristics of these eight standard door finishing systems were evaluated in an ISO 9000 certified laboratory using the following ASTM test criteria: Chemical Resistance Testing - ASTM D1308; Wear Index - Abrasion Resistance Testing - ASTM D4060; Cold Check Resistance - ASTM D1211; Cross Hatch Adhesion - ASTM D3359. Base line data for application prior to testing: A - 45 - 55% humidity at 70 - 80 degrees Fahrenheit (21 - 26 degrees Celsius); B - Water borne coatings must be cured in a dehumidified atmosphere and can be assisted with Infrared light and good air movement.

Performance indicator numbers on the Standard Wood Door Finishing Systems chart are used, with the following definitions:

For Chemical Resistance and Wear Index - Abrasion Resistance:

5 - No effect from the test
4 - Minimal effect or slight change and little repair required
3 - Some effect, noticeable change and the coating will recover with minimal repairs
2 - Moderate effect, performance adversely affected and repairs required
1 - Poor performance and film failure is imminent and repairs difficult

For Cross Hatch Adhesion

5 - Edges of the cuts are completely smooth; none of the squares of the lattice is detached
4 - Small flakes of the coating are detached at intersections; less than 5% of the area is affected
3 - Small flakes of the coating are detached along edges and at intersections of cuts; 5 to 15% of the area is affected
2 - Coating has flaked along the edges and on parts of the squares; 15 to 35% of the area is affected
1 - Coating has flaked along the edges of the cuts in large ribbons and whole squares have detached; 35 to 65% of the area is affected.

JOBSITE INFORMATION

J-1: JOB SITE INFORMATION FOR ARCHITECTURAL WOOD DOORS

To preserve the fine qualities of wood doors and a lifetime of superior service, proper storage, handling, finishing and installation is very important. This section is not intended to "Scope" the proper storage, handling or field finishing of doors received on the jobsite. The responsibility of properly preserving the quality of the architectural wood doors once shipped from the factory is the sole responsibility of the general contractor. The following guidance is provided to assist the general contractor to avoid damage that may occur to the architectural wood door due to improper storage, handling or field finishing. Contractors or subcontractors responsible for field finishing of wood architectural interior doors should consult the architect for the proper finish selection, color and sheen desired. Any damage as a result of improper storage, handling and finishing is not the responsibility of the manufacturer.

DIMENSIONAL CHANGES IN ARCHITECURAL MILLWORK

Wood has served as a successful material for structural and architectural millwork for centuries. When correctly designed and manufactured, wood products have demonstrated long lasting esthetics and product integrity throughout the lifecycle of a building or structure. Most issues regarding dimensional problems in architectural wood are directly related to uncontrolled relative humidity. Wood is hygroscopic in nature and under normal use and conditions contains some moisture. The relative humidity in the atmosphere effects the gain or loss of moisture in wood. In high humidity, wood will absorb molecular moisture and swell, which will cause warping or dimensional increases of the components. In low humidity, wood will release molecular moisture and contract, which causes contraction of the wood fiber resulting in cracking or checking of the components.

Architectural wood doors are manufactured as designed using kiln dried wood components to an appropriate average moisture content. Subsequent dimensional changes in these wood components is and always has been an inherent natural property of wood. Improper storage or handling of the doors once they are shipped from the manufacturing facility resulting in these types of dimensional changes will not be considered product defects and are not the responsibility of the manufacturer. Not adhering to or deviating from the following guidelines could result in voiding the manufacturer's warranty. It is the responsibility of the contractor to review and comply with the manufacturer's warranty in regards to the proper storage, handling and installation of the architectural wood door.

The following guidelines will help to maintain the high quality products supplied by wood door manufacturers. Also, the manufacturer's warranty and care and handling instructions should be reviewed for specific requirements.

J-2 STORAGE AND HANDLING

1. HVAC systems shall be installed and operable prior to the storage or installation of architectural doors. Do not subject interior doors to extremes of heat and/or humidity and maintain a balanced heat and humidity level on both sides of door. Prolonged exposure above or below the recommended temperature and humidity may cause damage. Buildings should maintain a relative humidity level of 25% to 55% and a temperature between 10°C to 32°C (50°F-90°F). Within these ranges wood doors should maintain a moisture content of 6-9%, a generally recognized range for millwork product stability. Problems are apt to occur when moisture content falls below or above these levels, such as shrinking, cracking, splitting, swelling, joint failure and panel movement. It's recommended that site storage, staging and installation areas be monitored for temperature and humidity from delivery to substantial completion to verify warranty compliance**.** Product moisture content should also be checked to ensure it stays within the acceptable range. Product damage noted above is an indication of over exposure to unacceptable relative humidity or temperature levels requiring remedial action. Once doors are installed, it is the responsibility of the building owner to maintain the relative humidity and temperatures necessary to minimize the dimensional changes in the doors.
2. Do not store doors in buildings where wet work is still being conducted, such as the taping and floating of drywall or concrete.
3. Store doors flat on a level surface in a dry, well-ventilated building. Doors should not come in contact with water. Doors should be kept at least 102 mm (4 in.) off the floor with a minimum of three evenly spaced cross supports (once removed from manufacturer's packaging) and should have protective coverings under the bottom door and over the top. Covering should protect doors from dirt, water and abuse but allow for air circulation under and around the stack.
4. Avoid exposure of interior doors to direct sunlight. Certain species (e.g., cherry, mahogany, walnut, and teak) are

more susceptible to discoloration if exposed to sunlight or some forms of artificial light. Consider using opaque protective covering of individual doors to minimize light damage after delivery.

5. Doors should always be handled with clean dry hands or while wearing clean dry gloves.

6. Doors should be lifted and carried when being moved, not dragged across one another.

7. Doors shall be acclimated on the jobsite prior to finishing and/or installation per manufacturer's recommendations.

J-3 FIELD FINISHING

To maintain the aesthetic appearance, integrity, quality and performance of architectural wood doors, the manufacturer does not recommend or advise field finishing. The following guidance is provided to persons performing the field finishing of the doors for informational purposes only. Unless stated otherwise in the warranty, the manufacturer is not responsible for aesthetic appearance of the field finished door due to the improper method of applying field finishes or selection of finish system. Persons performing the field finish should consult the product manufacturer of the finish system for the proper application to architectural wood door.

The following are considerations for maintaining the integrity of the unfinished factory architectural doors including, but are not limited to the following:

1. Persons performing field finishing shall protect all factory applied certification labels, so that they remain legible after applying the field finish. Any replacement necessary due to the damage or removal of the labels will be the responsibility of the person performing the field finishing.

2. For additional guidance, consult the applicable provisions of MPI Architectural Painting Specification Manual when field finishing architectural wood flush doors.

3. Wood is hygroscopic and dimensionally influenced by changes in moisture content caused by changes within its surrounding environment. To assure uniform moisture exposure and dimensional control, all surfaces must be finished equally. Field finishing of doors should be performed during one continuous process within the earliest timeframe from doors being delivered to the jobsite. Once the process is initiated, finishing should be completed immediately after allowing the required drying time between coats.

4. Wood is hygroscopic and dimensionally influenced by changes in moisture content caused by changes within its surrounding environment. To assure uniform moisture exposure and dimensional control, all surfaces must be finished equally. Field finishing of doors should be performed during one continuous process within the earliest timeframe from doors being delivered to the jobsite. Once the process is initiated, finishing should be completed immediately after allowing the required drying time between coats.

5. Doors should not be considered ready for finishing when initially received. Before finishing, remove all handling marks, raised grain, scuffs, burnishes and other undesirable blemishes by block sanding all surfaces in a horizontal position. Solid core flush doors, due to their weight, naturally compress the face veneer grain while in the stack. Therefore, sanding of the overall surface will be required to open the veneer grain to receive a field applied finish evenly. To avoid cross grain scratches, sand with the grain.

6. Certain species of wood, particularly oak, may contain extractives which react unfavorably with foreign materials in the finishing system. Do not use steel wool on bare wood, finishes in rusty containers or finishes that contain any other contaminates.

7. A thinned coat of sanding sealer should be applied prior to staining to promote a uniform appearance and avoid sharp contrasts in color or a blotchy appearance. Door manufacturers are not responsible for the final appearance of field-finished doors. It is expected that the person performing the field finish will make adjustments as needed to achieve desired results.

8. All exposed, unfinished wood surfaces should be finished and the top and bottom rails shall be sealed. Cutouts for hardware in doors located adjacent to areas where high moisture is expected should be sealed prior to installation of hardware.

9. Dark colored finishes should be avoided on all surfaces if the door is exposed to direct sunlight, in order to reduce the chance of warping or veneer checking.

10. High-gloss finishes should be avoided to reduce the enhancement of natural surface imperfections or undesirable characteristics.

11. Water-based coatings on unfinished wood may cause veneer splits, highlight joints and raise wood grain. Please

follow the finish manufacturer's recommendations regarding the correct application and use of these products.

12. The person performing the field finish is responsible to match the finish as specified and final approval of the field finish is the responsibility of the architect.

13. Certain wood fire doors may be impregnated with various materials that could have an adverse reaction to field finishing products and should be tested to determine if there is an unfavorable result.

14. For additional guidance, consult the applicable provisions of MPI Architectural Painting Specification Manual when field finishing architectural wood flush doors.

J-4 INSTALLATION

Where provided, the installer shall install the door in accordance with the door manufacturer's installation instructions. Where the installation instructions are not provided by the manufacturer, the guidelines below should be followed.

1. Doors shall only be hung in frames that are installed plumb, square and level. Ensure that all doors swing freely and do not bind in their frame.

2. Do not install doors in buildings where wet work is still being conducted, such as the taping and floating of drywall or concrete .

3. The utility or structural strength of the doors must not be impaired when fitting the opening, applying hardware, or preparing for lites, louvers, plant-ons, or other detailing.

4. Pilot holes must be drilled for all screws that act as hardware attachments. Wood screws threaded to the head shall be used for fastening hardware to non- rated doors and are required on fire-rated doors. Self-tapping or combination wood/metal screws are prohibited for attaching hardware on wood doors.

5. In fitting non-rated doors for height, do not trim top or bottom edge by more than 20 mm (3/4 inch) unless accommodated by additional blocking. Trimming of fire-rated doors must be in accordance with NFPA 80

6. The recommended clearance between the top, hinge edge and lock edge to the frame and meeting edge of pairs of doors, is 3.2mm (1/8 inch) +/- the dimensional tolerances referenced in Section P-2. The maximum clearance for fire doors at the top, hinge edge, lock edge and bottom shall be in accordance with NFPA 80 or manufacturer's listing.

7. All hardware locations, preparations and methods of attachment must be appropriate for the specific door construction and fire rating. Templates for specific hardware preparations are available from hardware manufacturers or their distributors.

8. Installation of all architectural hardware shall be performed in accordance with the manufacturer's published instructions and in compliance with applicable standards established by the Builders Hardware Manufacturers Association. Hardware shall be installed to meet the performance and operational requirements outlined in the appropriate ANSI/BHMA A156 Series Standards, including proper alignment, fastening, clearances, and functional operation. Installers shall ensure that all products are installed to maintain compliance with applicable fire, life safety, and accessibility requirements, and that no modifications are made that would void the product's certification or intended performance.

J-5 CLEANING AND TOUCHUP

1. Inspect all wood doors prior to hanging them on the job. Repair noticeable marks or defects that may have occurred from improper storage and handling.

2. Field repairs and touchups are the responsibility of the installing contractor upon completion of initial installation. Field touchup shall include the filling of exposed nail or screw holes, re-finishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and mars and final cleaning of finished surfaces.

3. When cleaning door surfaces, use a non-abrasive commercial cleaner designed for cleaning wood door or paneling surfaces that does not leave a film residue that would build up or affect the surface gloss of the door finish.

J-6 ADJUSTMENT AND MAINTENANCE

1. To properly ensure the working condition of the door(s), periodically test the door(s) so that it swings freely and does not bind in their frame. Adjust the finish hardware for proper alignment, smooth operation and proper latching

without unnecessary force or excessive clearance.

2. Review with the owner/owner's representative how to periodically inspect all doors for wear, damage and natural deterioration.

3. Review with the owner/owner's representative how to periodically inspect and adjust all hardware to ensure that it continues to function as it was originally intended.

4. Finishes on exterior doors may deteriorate due to exposure to the environment. In order to protect the door, it is recommended that the condition of the exterior finish be inspected at least once a year and re-finished as needed. Both exterior and interior finishes will change color over time.

5. Consult your door manufacturer for any warranty requirements for exterior applications.

REFERENCED STANDARDS

ADA
Americans with Disabilities
Disability Rights Section
U.S. Department of Justice
950 Pennsylvania Avenue,
NW Civil Rights Division
Disability Rights Section - NYA
Washington, D.C. 20530
https://www.ada.gov

ANSI
American National Standards Institute, Inc.
25 West 43rd Street, 4th floor
New York, NY 10036
www.ansi.org
ANSI A208.1 – 22 Particleboard
ANSI A208.2 – 22 Medium Density Fiberboard (MDF) for Interior Applications

ASTM
American Society for Testing and Materials 100
Barr Harbor Drive
P.O. Box C700
West Conshohocken, PA 19428-2959
www.astm.org
ASTM D1308 - 20 Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D3359 – 23 Standard Test Methods for Measuring Adhesion by Tape Test
ASTM F3561-25 -- Standard Test Method for Forced-Entry-Resistance of Fenestration Systems After Simulated Active Shooter Attack
ASTM D4060 - 25 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
ASTM E90 - 16 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E413 - 22 Classification for Rating Sound Insulation

AWI
Architectural Woodwork Institute
46179 Westlake Drive, Suite 120
Potomac Falls, VA 20165
www.awinet.org
Architectural Woodwork Standards, 2nd Edition

CHPS (part of the USGBC)
Collaborative for High Performance
Schools 2101 L Street NW
Ste. 600
Washington, DC 20037
www.usgbc.com

FSC™ Forest Stewardship Council
U.S. 708 First Street North, Suite 235
Minneapolis, MN 55401
www.fscus.org

GBI
The Green Building Initiative
7805 SW 40th Ave,

Suite 80010
Portland, Oregon 97214
www.thegbi.org

DHA
Decorative Hardwood Association
42777 Trade West Dr,
Sterling, VA 20166
www.Decorativehardwoods.org

ICC
International Code Council
500 New Jersey Avenue, NW, 6th
Floor Washington, DC 20001-2070
www.iccsafe.org
International Building Code (IBC) – all editions

MPI
Master Painters
Institute
www.MPI.net
MPI Architectural Painting Specification Manual Revision 2022

NEMA
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1847
Rosslyn, VA
www.nema.org
ANSI/NEMA LD-3 – 05 High-Pressure Decorative Laminates (HPDL)

NFPA
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169

www.nfpa.org
NFPA 80 – 25 Standard for Fire Doors and Other Opening Protectives
NFPA 101 – 24 Life Safety Code
NFPA 105 – 25 Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives
NFPA 252 – 22 Standard Methods of Fire Tests of Door Assemblies
NFPA 3000 – 25 Standard for an Active Shooter/Hostile Event Response (ASHER) Program
NFPA 5000 – 24 Building Construction and Safety Code

NIJ
National Institute of Justice
810 Seventh Street, NW
Washington, DC 20531
https://nij.ojp.gov

SCS
Scientific Certification Systems
2200 Powell Street, Suite 600
Emeryville, CA 94608
https://scsglobalservices.com

SFI
Sustainable Forestry Initiative, Inc.
2121 K Street NW, Suite 750
Washington, DC 20037
www.sfiprogram.org

UL
UL Standards and Engagement
1603 Orrington Ave., #2000
Evanston, IL 60201
ulse.org
UL 10B – 08 (Revised 2024) Standard for Fire Tests of Door Assemblies
UL 10C – 16 (Revised 2026) Standard for Positive Pressure Fire Tests of Door Assemblies
UL 752 11th Edition – 05 (Revised 2021) Standard for Bullet-Resisting Equipment
UL 752 12th Edition – 23 Standard for Bullet-Resisting Equipment

UL 1784 – 15 (Revised 2025) Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives

USGBC
U.S. Green Building Council
2101 L Street, NW, Suite 500
Washington, DC 20037
www.usgbc.org
LEED – Leadership in Energy and Environmental Design (current version)

WDMA
Window & Door Manufacturers Association
2001 K Street NW, Suite 300 Washington, DC 20006
www.wdma.com
ANSI/WDMA I.S. 6A-21 Industry Standard for Interior Architectural Wood Stile and Rails Doors
WDMA I.S. 10-18 Industry Standard for Testing Cellulosic Composite Materials for Use in Fenestration Products
WDMA T.M. 6-23 Test Method for Determining the Durability of Adhesives Used in Doors under Accelerated Aging Conditions
WDMA T.M. 7-23 Test Method for Determining the Physical Endurance of Wood Doors and Associated Hardware Connections under Accelerated Operating Conditions
WDMA T.M. 8-23 Test Method for Determining Hinge Loading Resistance of Wood Door Stiles
WDMA T.M. 10-23 Test Method for Determining the Screw Holding Capacity of Wood Doors
WDMA T.M. 15-23 Test Method for Determining the Vertical Edge Impact Resistance of Backing for Veneered Wood Door Stiles